Electrical Review

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Generator Room in Weyerhaeuser Lumber Mill, Everett, Wash., Showing Switchboard Generating Units and Exciter Set.

Application of Electrical Energy in Lumber Mills

Saws, Conveyors and Other Units Driven by Belted and Direct-Connected Motors — Special Requirements Peculiar to Lumber Industry — Mill Refuse as Fuel to Generate the Electric Power

By W. A. SCOTT

The lumber mills of the Pacific Northwest have recently been producing more heavily now than they were a few months ago, and the outlook for business is undoubtedly still brighter. While the market for Pacific Coast lumber in the Middle West has not improved as much as had been expected the export trade is considered an important factor for the near future. In fact, many foreign orders were received by the lumber companies earlier in the year. The railroads under normal buying conditions take about 33% of the lumber mill products, but have not as yet begun buying. However, their needs are great, and the mills foresee a heavy demand from that source as soon as an era of construction and expansion opens.

The newer mills, equipped for modern electric drive, have eliminated some of the old group drives from long line shafts and have thus reduced operating costs and increased production. The group belting drive for the heavier machines has been replaced by individual motor drive, in

many cases direct connected. Among the apparatus requiring belt drive are head saws, log hauls, resaws, swing saws, trimmer saws, gang saws and some features of the planing mill. The edgers, sizers, hog-fuel machines, some of the planers, blowers and other machines are directly coupled to motors. In the production of chopped-up mill refuse, known as hog fuel, the motor-driven belt conveyor is employed as a means of transportation to fuel bins at the boiler house or to storage. Belt conveyors for this purpose usually travel at a rate of 300 to 350 ft. per min., giving them a large carrying capacity.

Another and an increasing use for the motor-driven conveyor belt is one that makes it a lumber carrier. In such work a 24-in. belt operates in a trough, conveying stock from one process to another. In the following descriptions of installations in lumber mills the data relative to belts and motors will be considered together, as for each drive the motor and belt constitute a driving unit. These comprise, in most cases, constant-speed operations, but include some of variable-speed and intermittent drives.

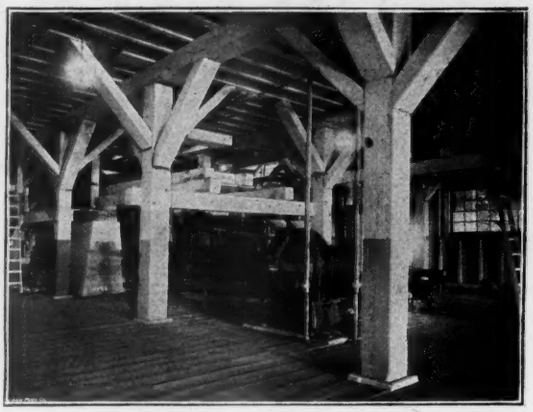
The plant of the St. Paul & Tacoma Lumber Co., Tacoma, Wash., comprises a lumber mill of

Motor-Driven Belt Conveyor Carrying Mill Refuse to Boiler House.

standard equipment, shingle mill and powerhouse. The main head saw, running at the rate of 10,000 ft. per min., is driven by a 250-hp., 440-volt motor of a speed of 580 r.p.m. This power is transmitted to the band saw by a 24-in., 2-ply leather belt operating on 17-ft. centers. The driving pulley is 32 ins. diam., the driven pulley being 60 ins. diam., both being compressed spruce wood pulleys. No. 2 saw is a double-cut band saw driven by a 250-hp. motor of the same speed and voltage as in the other unit. The motor's 30-in. pulley is belted to a 48-in. spruce pulley on the band saw shaft, the belt being 20 ins. wide and 17 ft. between centers.

The live rolls and chain conveyors are driven by belt connections with a 200-ft. line shaft on the lower floor, the latter being driven by a 200-hp. motor running at a speed of 580 r.p.m., the power being transmitted to the shaft by a 2-ply leather belt 24 ins. wide and 30 ft. between centers. In this drive the shaft pulley is 72 ins. diam. and that on the motor shaft 25 ins. diam.

The shingle-mill section contains six shingle machines, each having a shingle saw and clipper saw. All saws of the six machines are driven by a 200-hp. motor connected to a line shaft by a 2-ply leather belt 26 ins. wide and operating on 25-ft. centers. The motor for this drive is set on the first floor, the driven machines being on the sec-

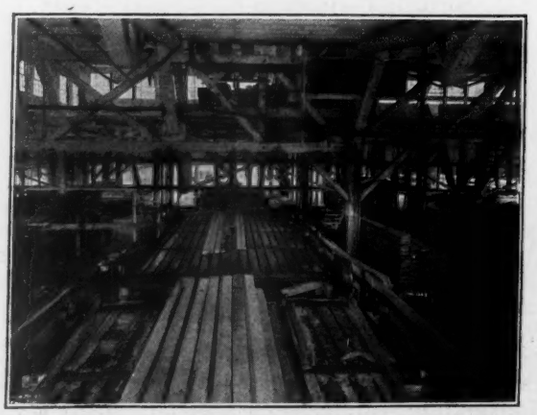


Motor in Weyerhaeuser Lumber Mill Driving a Gang Saw by Means of 24-In. Belt.

ond. This is an installation in which it is said the group drive of similar machines could not advantageously be replaced by individual motors. A 12 by 72-ft. edger is driven by a 200-hp., 1200-r.p.m. motor to which it is direct connected. The edger feed rolls are operated by a 15-hp., direct-connected motor of adjustable speed, allowing for a maximum of 900 r.p.m. Next in importance there are two 40-ft. trimmers of 22 saws for each set. This is another case of group drives from a line shaft, the shaft being driven by a 75-hp., 900-r.p.m. motor through belt transmission with each individual saw of the two 40-ft. units belted to the line shaft. The feed rolls for the trimmers are operated through chain belts.

In this mill there are three good examples of belt conveyors in use as lumber carriers. One of these consists of a 24-in. rubber belt 125 ft. between centers, running at a speed of 300 ft. per min. It is driven by a 5-hp. motor connected thereto by a chain belt. A second conveyor of canvas, of the same length and similarly driven, carries lumber for sorting. A third conveyor of canvas handles 150,000 ft. of lumber in 8 hrs., spruce pulleys being used on all these equipments.

Most of the refuse of this mill is utilized as fuel, a good part of it being consumed by twelve 280-hp. Stirling boilers operating at the mill. The rest is sold to other consumers of fuel. The



Belt-Driven Feed Rolls for Planers in Weyerhaeuser Mill.

View in Weyerhaeuser Lumber Mill, Showing Lighting Equipment and Motor-Driven Machinery.

coarse refuse, including cuttings of all kinds, is reduced to a reasonably fine consistency by motor-driven hog machines. Three such machines, each directly coupled to a motor, work up this refuse rapidly into good form for fuel. They are driven by 75 and 100-hp. motors operating at speeds of 720 to 900 r.p.m. and "chew" up the blocks and cuttings at high speed. The bulk of the hog fuel is conveyed to the boiler house over 980 ft. of belt, operated in two sections at the rate of 340 ft. per min. One section is driven by end belting a 10-hp., 1200-r.p.m. motor, and the other is driven by a 7.5-hp. motor running at 1800 r.p.m. Another section of this conveyor extends 700 ft. in the opposite direction and operates at the rate of 280 ft. per min., delivering fuel to scows on the waterway.

Planing Mill Equipment All Operated by Means of Motors.

The planing mill is equipped with 16 planers, all operated from a motor-driven main shaft with

Motor-Operated Grinder Used to Sharpen Band Saw in Lumber Mill.

leather belts connecting to the machine sideheads. Two Sturtevant and American suction and discharge fans for handling the planing mill refuse are direct-connected to the driving motors. One 84-in. fan is run at a speed of 690 r.p.m. and a 60-in. double suction fan at 580 r.p.m. The third, a 60-in. double fan, is belted to the motor to run at a speed of 980 r.p.m. This refuse is blown through a metal duct to fuel storage bins at the boiler house.

The company produces its own electric power by means of an Allis-Chalmers 2500-kw. turbo-generator and a General Electric turbogenerator of 1000-kw. capacity. Both are 3-phase, 60-cycle, a-c. machines. In addition to these there is a 75-kw., 120 and 250-volt d-c. turbogenerator and a 75-kw. motor-generator set, the d-c. power being used for electric cranes, electric locomotives and a monorail system.

Electrical Equipment Installed in the Weyerhaeuser Mill B.

Mill B, of the Weyerhaeuser Lumber Co. at Everett, Wash., is the newest of its plants and is an exemplification of all that is modern in the way of equipment required for the processes of manufacturing all classes of lumber from the great fir logs brought in by both rail and water from the Washington forests. The mill is situated on the Snohomish river, the log pond having an inlet from that stream. All machines and appliances are electrically operated, power being supplied by the company's own steam generating plant.

While the direct-connected motor drive is in evidence in various parts of the mill, there are many units requiring belt transmission. In operating the log-haul by which the logs are brought from the pond up to the sawmill deck there is required a 75-hp., 900-r.p.m. motor and a 14-in. heavy 2-ply leather belt 47 ft., 4-5 ins. in length,

running on 16-in. and 3-in. pulleys. The head saw, driven from a 250-hp., 550-volt motor, requires a 24-in. 3-ply leather belt about 25 ft. between centers, with a 32-in. pulley on the motor shaft and one of 62 ins. on the band saw. The second, a 9-ft. band saw, is driven by a 200-hp. slip-ring motor, the power being transmitted from the 34-in. motor pulley to the 54-in. saw pulley by a 20-in., 3-ply leather belt 47 ft. in length.

The four 42-ft. trimmers with 44 saws to the unit are driven from a line-shaft, the latter being operated by a direct-connected 75-hp. motor. A short high-speed belt transmits power from the line shaft to each trimmer saw. Nos. 1, 2 and 3 resaws are belted to three 75-hp. motors, and each one of the two gangsaw units is driven by a 200-hp. motor. The gangsaw makes about 250 strokes per min. The three swing saws are each driven by a belted 20-hp., 600-r.p.m. motor.

The two edgers are high-speed machines and are direct-connected to 200 and 250-hp., 1200-r.p.m. motors. The edger feed rolls are driven by 10-hp. and 7.5-hp. variable-speed motors having a speed range of 600, 900, 1200 and 1800 r.p.m. All refuse from the planing mill machines is taken up by motor-driven suction fans and is blown through ducts to fuel bins by a Sturtevant discharge fan. The eight trimmer saws in the planing mill are belt-connected to a line shaft, the latter being motor-driven. An interesting feature of this mill installation is found in the saw-grinding room shown in one of the illustrations. This shows a Symonds band saw being sharpened by a Covel grinder, the latter being driven by a 10-hp., 1200-r.p.m. motor belted to the grinder pulley.

In the power house is an Ingersoll-Rand air compressor connected by a short heavy belt to a 100-hp., 720-r.p.m. motor. The generator room, illustrated herewith, contains two Allis-Chalmers 3-phase, 60-cycle, 550-volt turbogenerators, one rated at 1000 kw. and one at 2000 kw. Direct-current energy is also produced for operating five 7-ton Westinghouse-Baldwin storage-battery locomotives and trolley-line locomotives. General Electric motors are installed throughout the mill, for which there is a connected load of 5000 hp. although that is considerably in excess of the amount of power actually used.

Steam-engine drive by means of belt transmission characterizes the principal operations in the Eclipse lumber mill at Everett. Three engines are in service, and the system of belts by which power is transmitted to the heavier machines of the mill constitutes an efficient installation.

Engine No. 1 drives the main band saw, a double circular saw and the edger. It has two flywheels carrying heavy belts for two driving units. The first, an 11-ft. wheel, running at 145 r.p.m., carries a 28-in. leather belt, 30 ft. between centers. It connects to the pulley of the band saw. The second, a 9-ft. flywheel, carries a 24-in. leather belt, 42-ft. between centers, connected to a line shaft from which the edger is driven by means of an 18-in. belt that has a length of 30 ft. between centers. The log haul is belted to the same line shaft. A second drive from the main line shaft consists of a belt to the double circular saw.

Engine No. 2 has a 9-ft. fly-wheel, running at 150 r.p.m., which carries a 26-in. belt that drives a line shaft, there being a distance of 24 ft. between the flywheel center and that of the line-shaft pulley. One of the units on this shaft is the belt drive to the gangsaw on the floor above. This consists of a 12-in. belt operating between 9-ft. centers. There are other minor drives from the same shaft.

Engine No. 3, having a 9-ft. flywheel of the speed of 350 r.p.m., drives a Bullock electric generator that produces energy for driving trimmer saws, resaw, lumber conveyors and planing-mill machines. The engine flywheel is connected to the generator by a 24-in. leather belt, 21 ft. between centers.

The motor drives in most cases involve belt transmission. The three trimmer saws are operated from a line shaft which is driven by a 75-hp. motor. Another motor drive is applied to the resaw on the second floor, that machine being belted to a motor on the first floor.

A long belt conveyor, running inside a trough, and motor driven, serves to carry lumber from the gangsaw to the dry kiln. In this plant leather belts are used on the heavier drives, a considerable amount of rubber and canvas belting being in use for other drives and for conveying purposes.

OHIO AUTOMOTIVE ASSOCIATION TO MEET IN COLUMBUS.

On the eve of what they look forward to as the banner year in their business, members of the Ohio Automotive Trade Association from all over the state will gather at Columbus, O., for their fifth annual convention Dec. 13-16. "There is not the slightest doubt among our membership but that 1922 will be the greatest year in the history of the automotive industry," said Elbert J. Shover, secretary of the association, which embraces dealers in passenger and commercial cars, tires, accessories and automotive equipment and operators of service and battery stations and garages. "The consensus of opinion among the 1200 members of our association, representing the retail branch of the complete motor vehicle industry and including jobbers and distributors, is that people who have been deferring purchases of cars, needed accessories and general automotive equipment will start to buy the first of the year. This opinion has been based upon actual expressions by prospective consumers, who have been frank to admit that, in common with the bulk of the buying public, they have withheld orders until they were convinced the bottom had been reached in prices, but that they firmly intended to make purchases early in 1922."

Convention sessions will be held in the Elks' Home, while the educational exhibit will be housed in Memorial Hall. The first exhibit of the association was given last year in Cincinnati, attracting national attention. Higher standards of qualification for the men engaged in the automotive field will be one of the main themes of the round-table discussion during the convention, according to the association secretary. "Although the automotive industry is now second among the great branches of productive activity, it is still the baby," said Mr. Shover in announcing the meeting this year.

Outdoor Substation Installation in France

American Made Equipment Installed in First Outdoor Station Placed in Service—Load Supplied by Electric Furnaces Used in Manufacture of Carbon—Other Work Is Now Under Way

By S. H. ABBOTT

This article, prepared by Mr. Abbott of the Westinghouse Electric & Manufacturing Co. for the Westinghouse Electric International Co., was written by the author after spending 9 mo. in France in charge of the construction and starting of the stations described.—Editor's Note.

The first outdoor substations in France are found among the picturesque, snow-covered peaks of the Pyrenees mountains. In these mountainous districts many of the small lakes and streams have been harnessed for hydraulic power. Such is the case with those around Luchon which is the most important resort of the Pyrenees as well as the most ancient in the world. This town is situated midway between the Bay of Biscay and the Mediterranean Sea.

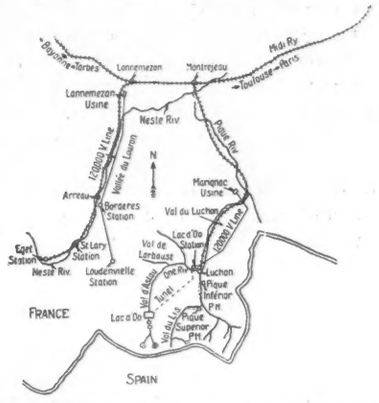
Here the Cie d'Electricite Industrielle, with Ferdinand Gros & Bouchardy as engineers, have erected two outdoor substations, which were the first in operation in France, having been put in service March, 1920. These stations now receive

Assembled Lightning Arrester Tank Being Rolled Into Position at Marignac.

their power from two new hydraulic power houses with a combined capacity of approximately 25,000 kv-a.

These power houses are south of Luchon, on the Pique river, and are known as Pique Inferior and Pique Superior. This river flows northward from the snow-capped peaks through the Pique valley, while its tributary runs through the beautiful valley known as "Vallee du Lis"; that is, the "Valley of Lilies." At the junction of the river One, which flows down the Larboust valley, and the Pique river, is Luchon.

A larger power house of 20,000 kv-a. capacity,



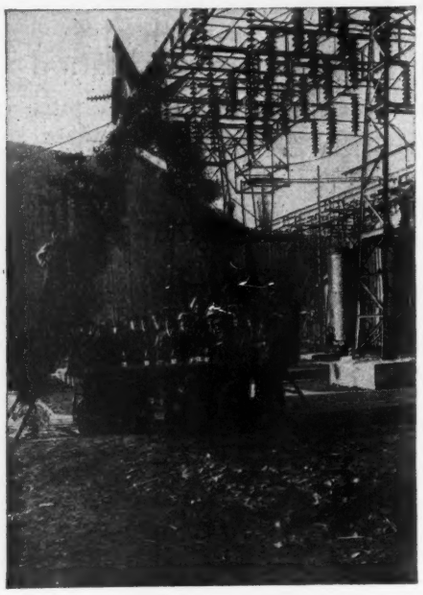
Map Showing Location of Stations and Lines.

known as "Lac d'Oo," has been erected. This power house is just outside Luchon on the river One, and is fed by water carried from Lac d'Oo through a 7-mi. tunnel in the mountains.

At the Lac d'Oo power house is the first of the two 18,000-kv-a. outdoor substations. At present this station transmits the power 10 mi. down the Luchon valley to the second outdoor substation located at the factory of the Cie d'Electricite Industrielle just outside Marignac. These substations are built for 120,000-volt transmission, which voltage the French government has adopted for its standard, and it is planned that all high-tension lines can and shall be interconnected. Now, however, the transformers are connected in delta, giving a line voltage of 70,000, with a 10,000-volt secondary system.

The accompanying illustrations show a few views of the installation. The iron work was already in place prior to the arrival of the writer, and that of the apparatus. The electrolytic lightning arrester tanks are much taller than those usually used. To permit their inspection without shutting down the plant a novel arrangement was worked out, the tanks being placed on small trucks about 4 ins. high, similar to those used for transformers. A narrow gage track was run into the transformer house, and a truck built for it. Now, to make any inspection or repairs, it is necessary only to disconnect the arrester from the line, remove the stay bolts from the tanks, and roll the tank off its insulating foundation onto the truck. The truck with the tank can then be taken into

the transformer house where, with a hand crane, the inspection is easily made. One of the illustrations shows a tank finished complete, with trays, electrolite, oil and bushing, being rolled

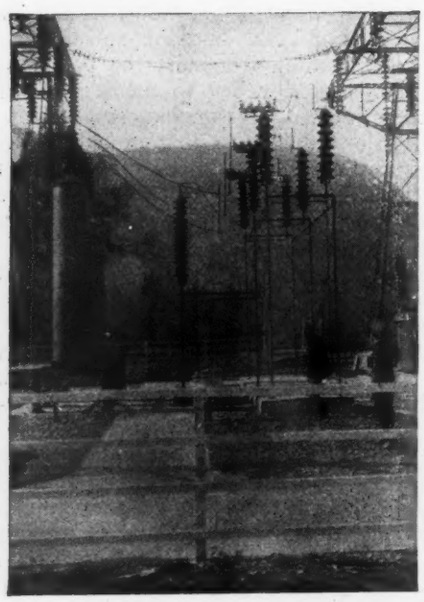


Photograph Taken During Christening of Substation at Marignac.

out of the transformer house to its permanent position.

The greater part of the power used at Marignac is for electric furnaces in the manufacture of carbon. Besides carbon the factory turns out numerous other products and uses much wood which is procured from the forests in the nearby mountains. The chief by-product from the wood is "sabots," or wooden shoes.

It is the custom in France to celebrate more



Charging the Lightning Arrester in Substation at Marignac.

elaborately than in this country the completion of a piece of work. An accompanying illustration shows the christening of the substation at Marignac, with its decorations and fine wine. A similar commemoration took place at Luchon.

The railroad which feeds this section is a branch of the Midi line, and starts at Montrajeau. A few miles west of Montrajeau is Lannemezan, and near there a similar factory, with Westinghouse apparatus, is operated by the French government. A branch line runs from Lannemezan through the "Vallee du Louron" to Eget, in the mountains, and here is a hydraulic power house and inside substation from which the railroad derives its power. The Eget branch is now electrified (alternating current) and is the first of the proposed Midi electrifications.

When the writer was in France there were under construction in the "Vallee du Louron" at Borderes and Loudenvielle two hydraulic power houses and outdoor substations of Westinghouse equipment. These stations, with the Eget station and St. Lary station, are intended to furnish power for the Lannemezan factory.

In the November, 1920, issue of the *Revue Generale de l'Electricite,* Monsieur Waternau (Ingeneur a la Cie Electro Mecanique) states that the "usines du Louron" were the *first to adopt* the outdoor type substation. In spite of this fact, the Luchon and Marignac stations were *the first in operation.*

DEVELOPMENT OF THE ELECTRICAL INDUSTRY IN OKLAHOMA.

Oklahoma leads other states in the Union in the production of oil and a number of other products, and justly prides herself in these things. Through failure however to give proper encouragement to public utility industries the development of electrical and some other public utility branches has been hindered in Oklahoma. This is shown in the fact that Oklahoma stands 26th among the states of the Union in the production of electricity from fuel and 29th in the production of electricity from water power.

According to figures just compiled by the U. S. Geological Survey, Oklahoma in July, 1921, produced 17,211,000 kw-hrs. of electricity from fuels and 225,000 kw-hrs. from water power, or a total production of 17,436,000 kw-hrs. The total production of electricity from both sources in the United States for July, 1921 was 3,269,976,000. This shows that Oklahoma produced only a little more than one-half of 1% of the entire output of electricity of the United States for the month of July. Only a little over 10% of the potential water power resources of Oklahoma have been developed. The state is now utilizing 25,700 hp. in hydroelectric plants whereas it has potential possibilities of 224,300 hp.

For some time Mexican authorities have offered inducements for the establishment of hydroelectric plants in or near the Federal District, reports Assistant Trade Commissioner R. M. Connell, the plant of the existing power company being inadequate for the needs of the region. A decree has been issued reducing Federal taxes on the use of water for power and irrigation, and the press announces that two Mexicans have now submitted a proposal for the erection of such a plant.

Protection of Transmission Lines With Condensers—Part I.

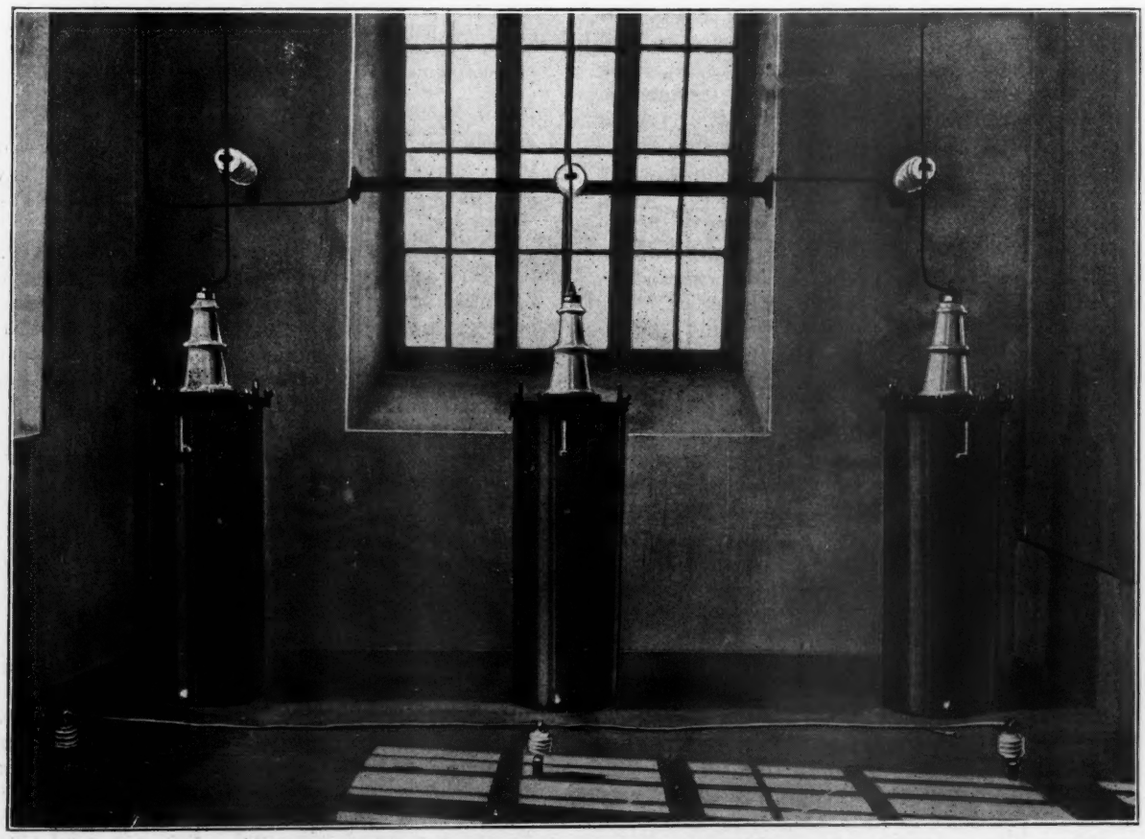
High-Frequency Disturbances and High-Voltage Surges Relieved as Result of Satisfactory Performance of Static Condensers — Influences of Short-Circuit Eliminated in Test on Heavy Line

By GEORGE LEWIS
Consulting Engineer, Brooklyn, N. Y.

Transformation stations are by virtue of electrical and economic conditions usually placed in rather exposed locations where lightning and its associated disturbances are most pronounced. This condition has been studied by transmission engineers in an effort to introduce a protection to the system from high-frequency potentials, but even with the protection afforded at present, failures in static and rotating machinery are common. There is at present no apparatus which will protect a system from a direct stroke of lightning which may be impressed directly upon the transmission line. The protection as installed consists of a well-grounded screen wire stretched over the transmission conductor to guard against side strokes, or various forms of apparatus introduced as a ground leak to relieve the line from abnormally high pressure.

Aerial transmission lines are subjected to abnormally high potential rises from two principal causes. When highly charged clouds pass over a transmission line an electrostatic charge is introduced on the line of opposite polarity from that of the cloud. As the clouds are continually moving in different directions and at different velocities the value of this line charge will vary. An accompanying illustration shows a negative-charge cloud *F* passing over a transmission line *G*. When the cloud is suddenly discharged to ground or to a neighboring cloud the accumulated electrostatic charge, now having its influencing charge suddenly removed, will surge along the line in the form of a traveling wave. The potential of this wave pulse may not exceed the line pressure more than several thousand volts, but the abruptness of the wave front is such as to cause abnormally high voltages at points in the transmission circuit where the electrical constants of the line are suddenly altered.

Electrical oscillations are induced in a trans-



Installation of Mica Condensers on 3-Phase Circuit in Substation.

mission line from lightning discharges which take place within a radius of several miles of the line. The illustration already mentioned represents the electrical configuration of a line *G*, a choke coil *J* and the winding of either a transformer or a machine *M*. Each portion has inductance and capacity uniformly distributed, although their con-

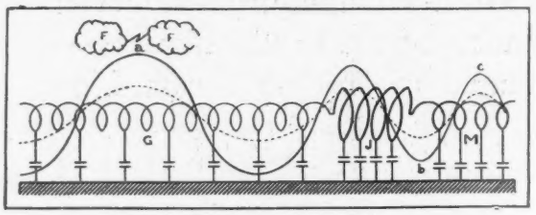


Diagram Showing Effect of Charged Cloud Over Transmission Line.

stants per unit length vary. The shapes *F* and *F* represent two clouds between which an electric discharge is taking place. It is evident that the clouds simulate a 2-plate Hertz oscillator, but on a high scale, and they therefore send out high-frequency waves whose periods are in the order of some hundreds of thousands of cycles per second. The transmission line is nothing more than an insulated wireless antenna, so that the line receives these waves just as a radio antenna would. As it is further true in a radio antenna the received lightning waves seldom if ever induce potentials great enough to disrupt the insulators, so in the transmission line they seldom rise above several thousands of volts and, accordingly, do no damage here.

However, the waves are propagated along the line with the speed of light, their potentials being greatest at "a" where they enter the line and where they start with a wave length equal to that radiated from the lightning discharge, and so continue until they reach the choke coil *J*. Here a wave passes through the concentrated inductance, but its length is abruptly shortened. It arrives at the machine *M* with its wave length further modified and continues to the end of the winding, from

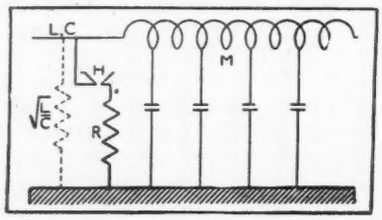


Diagram of Horn-Gap Lightning Arrester Connected to Transmission Line.

which it is reflected backward as shown by the broken line. The wave travels, as shown, to the other end of the transmission line and is then reflected backward and forward until all its energy is consumed by the ohmic resistance of the circuit.

Between "b" and "c", respectively, the points of maximum negative and maximum positive potential, the greatest potential difference exists. With high frequencies of several hundred thousand to a million cycles, such as lightning discharges have, it is quite possible for this whole potential difference to be concentrated between the first few wires in the transformer or electric machine. Since the enamel and cotton insulation between these, even in high-voltage apparatus, could hardly be made to withstand a thousand or more volts in pressure the transformer or machine is simply burned out.

We thus come to the important conclusion that if the proper protection is not afforded high-frequency line surges, even of a few thousand volts, are capable of destroying the insulation of an alternator or transformer generating a terminal potential of, say, 50,000 volts. This high-frequency breakdown phenomenon has been appreciated in the design of many electrical windings where the first few turns of the apparatus have been constructed so as to be readily removed for repair when breakdown occurs.

Horn Arresters and Static Condensers for Line Protection.

Horn arresters are extensively employed throughout this country on relatively low-potential circuits for lightning protection. From the foregoing it can be appreciated that this class of apparatus affords no protection against the high-frequency transient phenomenon, as the potential of the system was not materially increased by the presence of the high frequency, and the operation of a horn gap relies upon an increase in the line potential over the electrical operating value of the gap. The horn gap, however, is introduced in an

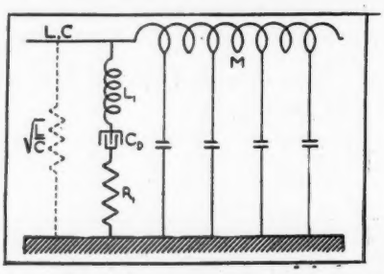


Diagram Showing Inductance and Capacity Used in Place of Horn Gap.

effort to protect the system against line surges of steep wave front pulses as brought about by switching and the sudden release of bound static charges.

When a horn gap is connected directly between the line and ground and is operated by high-potential surge a dead short-circuit is established between the line and ground, due to the low resistance of the arc stream formed between the horn electrodes. In order to modify as far as possible the high potentials caused by a horn gap when discharging, a resistance is employed in series with the gap. The value of this resistance has been the subject of frequent debates in several of the electrical societies, but at present it is generally conceded that the value should be somewhere between $3(L/C)$ and $0.2(L/C)$, where L and C are the inductance and capacity of the line.

The surge impedance, L/C, for overhead transmission lines average between 300 and 600 ohms; therefore the series resistance should range between 60 and 900 ohms for lines having the lower surge impedances, and between 120 and 1800 ohms for lines within the higher range of impedances. Consider that the line has a natural frequency in the neighborhood of 50,000 cycles and that a spark to ground would introduce dangerous resonance potentials. It is quite essential

that the gap be provided with a series resistance in order to modify as much as possible the resonance phenomena. Prof. Thompson states that free oscillations are just possible when the resistance of a circuit is so great that $CR^2 = 4L$. Therefore, to prevent resonance phenomena the series-gap resistance must be at least 900 ohms, assuming that the surge impedance is 450 ohms.

In an accompanying diagram is shown a transmission line and the winding of an alternator protected by a spark gap having the regular horn-shaped electrodes H. The necessity for having the resistance R in series with the gap has already been dwelt upon. The resistance must be at least large enough to allow only a nonoscillatory current to flow after the breaking of a spark. The value of such a resistance, as we have seen, must be at least 1200 ohms. In practice, however, it would not be safe to employ less than a 2000-ohm resistance R in the above mentioned diagram. The maximum theoretical surge E_s, if there were no resistance whatever in the arrester across the line, has the following value: $E_s = I_s \sqrt{(L/C)}$, in which I_s is the short-circuit current and the radical is the same as before.

The maximum surge potential E_s which could be obtained in the above illustrated system when a spark which is discharging across the horn arrester is broken, as found by Ivan Dory, equals

$$E^1_s = I_s[R\sqrt{(L/C)}/R + \sqrt{(L/C)}].$$

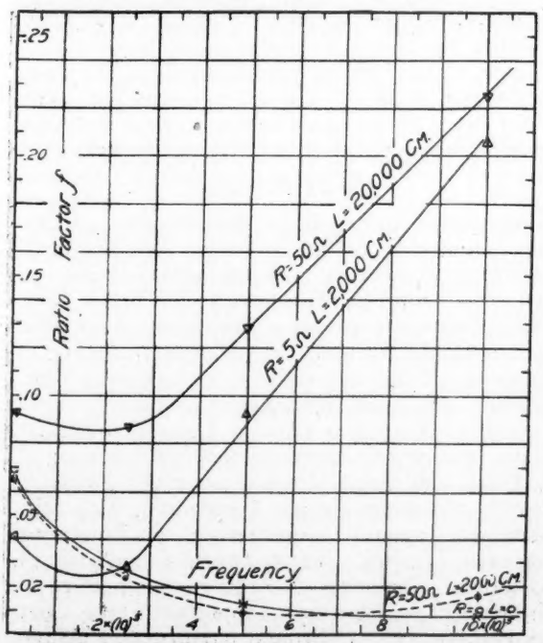
Comparing the two surge potentials,

$$E^1_s/E_s = R/(R + \sqrt{(L/C)}.$$

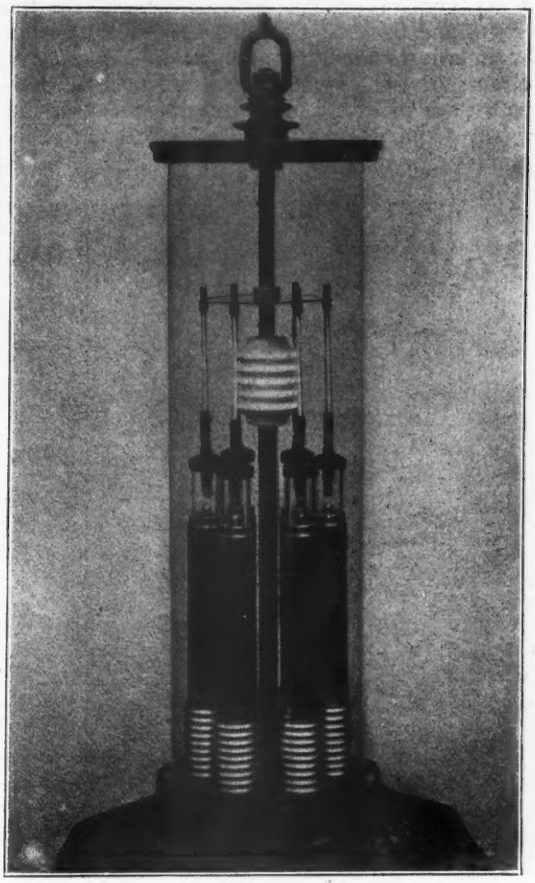
Substituting the value of these constant and assuming the surge impedance as 600 ohms,

$$E^1_s/E_s = 2000/(2000 + 600) = 77\%$$

and, hence, the reduction in potential rise which can be brought about by the horn arrester is 23%. If we should substitute a resistance R of 5000 or 10,000 ohms instead of that of 2000 we will find that the reduction is still less, being approximately 10% in the one case and 6% in the other.



Curve Showing Effect of Employing Different Values of Inductance, a Condenser and a Resistance in Discharge Circuit.



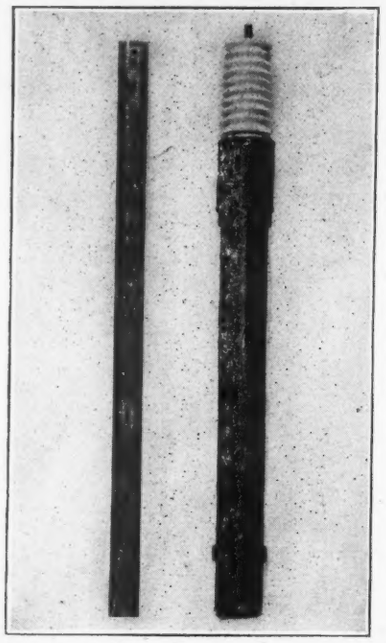
Battery of Giles Valves, Consisting of Two Spark Gaps and a Series Resistance.

The effects of employing different sizes of an inductance L, a condenser C_d and a resistance R, in place of the horn arrester and resistance connected as shown in another accompanying sketch has been arranged in curve form. Here the reduction ratio with respect to the maximum surge tension produced by the abrupt opening of a short-circuit is again determined by calculations somewhat different from those preceding, but ones which are often used in telegraph and telephone work. The value of the capacity C_d need be only slightly greater than that corresponding to one-half a wave length of the line it protects, and for these computations a standard Dubilier system was assumed.

In general, it may be stated that all apparatus depending on the electric strength of air for its operation is being slowly discarded, as it is not only valueless for protection against high frequency unless the potential of these currents is extremely high as compared to the operating potential of the line, but the electrical functioning of the apparatus is such that operation will only take place when the potential of the line has acquired a dangerous value. From the foregoing it can be appreciated that apparatus depending for operation upon the electric strength of air cannot possibly protect equipment against the potentials brought about by high-frequency oscillations.

When a static condenser is connected between the line wire and the ground of a transmission system a free path is introduced for high-fre-

quency currents which may be present on the system, and this static condenser also automatically interposes a high resistance in the path of currents of the operating line frequency. This faculty has made the electrostatic condenser extremely popular as a protective device, as no other electrical device fulfills the two conditions simultaneously. A static condenser connected between line and ground may therefore be termed a steering medium deflecting the high-frequency currents and automatically preventing the line current from following in the high-frequency path to ground. When this condenser is operated without a series resistance practically all of the discharge shunted through the condenser is again returned to the line. This return discharge is quite modified in respect to wave shape and is eventually damped out by the ohmic resistance of the line. Investigations indicate that the degree of protection is greatly increased when the condenser is provided with an ohmic resistance, even when this practice materially increases the resistance of the path for the high-frequency currents.



Half-Tube Mosciki Condenser of 0.002-Microfarad Capacity.

During the past few years a number of articles have been published in the various scientific papers presenting the merits of an electrostatic condenser when employed in connection with transmission circuits as an electric valve to relieve the system of abnormal disturbances. While the engineering papers have been unanimous in their conclusions that the condenser is a most ideal device, the introduction of apparatus of this class has been rather slow in this country, notwithstanding the fact that electrostatic condensers have been employed in Europe for a number of years and are at present rapidly replacing the older stationary sparking electrode and liquid-filled arresters.

It may be stated that in Europe the distance over which power is transmitted is very much less than in American practice; hence the apparatus employed on these relatively low-potential lines cannot be applied to the high-voltage American transmission systems where the surge impedance and liability to pressure rises, due to conditions within the line being different. The increased potentials due to causes exterior to the transmission line, however, can be compared with some degree of safety.

An improved form of spark-gap arrangement of abnormal tension has been devised by Georges Giles with a view to overcoming the difficulties experienced with the horn-type arrester where the current flowing across the device to ground is suddenly interrupted at its maximum value. A battery of Giles valves of the later type is shown in an accompanying illustration. The valve consists of two spark electrodes inclosed in a glass cylinder. These electrodes are located at the top line-potential end of the unit and are so adjusted as to operate when the potential of the line being protected rises some 20% above the operating value. The lower spark electrode is connected to a series resistance having a value somewhere between 800 and 1200 ohms. This resistance is wound on a cylindrical form of insulating material measuring approximately 8 ins. long and 2 ins. diam. Directly under and supporting the resistance is located the arcing disk rings which consist, as shown at the bottom of the illustration, of 8 nonarcing metal annular rings so assembled on and insulated from a central metallic tube as to form a series of small sparking paths to earth. The annular rings are so formed as to provide a small distributed-capacity path between their inner edges and ground. The physical dimensions of the total unit are 36 ins. in over all height and 10 ins. diam.

This type of arrester is employed in connection with European transmission systems in preference to the horn-type arrester, as the operating value of potential of the Giles valve is much nearer the normal value of the line plus the characteristics contributed by the system of arcing electrodes and distributed capacities which renders the device self extinguishing at potentials slightly greater than the operating voltage of the line.

(To be continued.)

ELECTRICAL INSPECTORS TO MEET IN CHICAGO.

Announcement has been made that the 17th annual convention of the Western Association of Electrical Inspectors will be held in Chicago, Jan. 17-19, with headquarters at the Hotel Sherman. Various convention committees have been appointed, the names of the chairmen of some of the principal committees being as follows: V. H. Tousley, chairman, Executive Committee; A. E. Tregenza, chairman, Finance Committee; S. R. Todd, chairman, Entertainment Committee; C. B. Giles, chairman, Hotel Committee; Frank F. Stover, chairman, Badges Committee; E. J. McGann, Photograph Committee; E. R. Townsend, chairman, Ladies' Entertainment Committee; J. S. Mahan, chairman, Reception Committee; F. G. Waldenfels, chairman, Inspection Tours Committee; W. H. Coleman, chairman, Publicity Committee, and William S. Boyd, chairman, Program and Printing Committee.

Installation and Maintenance of Customers' Transformers

Attention Given to Details at Time of Original Installation, and Proper Checking of Load and General Conditions, Reduce Chances of Failure—Paper Before District Managers' Meeting

By C. S. KNOWLES

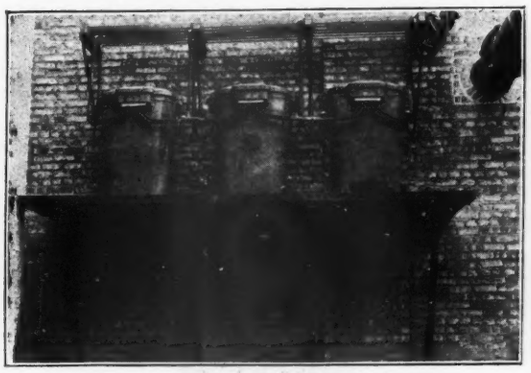
Superintendent of Construction, Pacific Power & Light Co., Portland, Ore.

The manufacturers of today are shipping transformers ready for installation with the exception of filling them with oil. It is the usual practice of the manufacturers to ship all transformers with the internal connections made up for the highest voltage; that is, with a 6600-volt transformer with variable taps on the primary side we assume that the transformers are connected for 6600 volts on the primary side. However, there have been found several instances where this was not true. It is, therefore, important that before the transformer is installed the internal connections be checked to make sure that the necessary connections are made and the best possible contact obtained. An arcing contact under oil, if inclosed in an air-tight case, will generate gas from the oil and in extreme cases cause the transformer to blow up.

Before any voltage is applied to the transformer, or the transformer is put in service, it is necessary that the transformer case be filled with oil to a height indicated by a manufacturer's mark on the inside of the case. Too much care cannot be exercised in filling the transformer with oil. If the oil is too low the live parts of the winding and terminals will not have the required insulation which the oil is supposed to give. If too much oil is placed in the tank it will have a tendency to leak out through the primary or secondary bushings. Also, there will be a syphoning effect on both the primary and secondary leads. In filling the transformer case with oil great care should be taken to fill the case with a good grade of oil, either the oil which is furnished with the transformers or oil you know positively to be in a good condition and free from moisture and foreign matter. The writer can recall several instances where transformers have been burned out, due to filling the tank with oil containing a large amount of moisture. It is, therefore, suggested that oil removed from a transformer for the purpose of installing it at some other point be not used again until such time as it has been filtered. This can be done easily by having a sufficient supply of good oil on hand at all times, with extra drums of sufficient capacity to hold old oil or oil removed from transformers. No oil from any kind of a container should be poured in a transformer tank without straining the oil through at least four thicknesses of cheese cloth.

Transformer oil is used for two particular purposes; first, for cooling, and, second, for insulating purposes. The use of oil for insulating has made possible a large reduction in the size of transformers, because if oil were not used for insulating purposes it would be necessary to install the windings in a well ventilated case, and it would be almost impossible to make them weatherproof. It is, therefore, important that all transformer oil be kept free from moisture. A good grade of oil will withstand a test of 25,000 volts with terminals spaced 0.1 in. apart.

After the transformer has been thoroughly inspected, tested, the desired connections made, and filled with oil it is ready to be put in service. Transformers should be installed in an upright position and as nearly level as possible, because if installed on a pole which leans to any extent the oil on either side of the transformer is liable to be low and some of the live parts of the winding or terminal board will be without sufficient protection. This condition should not be allowed to exist. It is also important that the transformer case and the neutral points of the secondary winding be grounded. I would also call attention to the importance of closing the doors on all 6600-volt cutouts. This will eliminate bird nests in the cutout boxes and, no doubt, will have a tendency to reduce the number of fuse boxes which burn up as a result of such a condition.



Bank of Small Power Transformers.

Open Delta Connection Reduces Transformer Load Capacity.

The majority of our 3-phase power installations consist of two transformers connected in open delta. In connecting transformers in open delta it must be thoroughly understood that only 86% of the transformer capacity is available for use. For instance, with two 5-kw. transformers connected open delta 8.6 kw. of transformer capacity is available for 3-phase use, but if three

Note.—Illustrations supplied by Electrical Review.

5-kw. transformers are connected in closed delta 15-kw. capacity is available. It is preferable, although not absolutely necessary, that transformers connected in open delta have exactly the same ratio, but with transformers connected in closed delta it is absolutely necessary that each one of

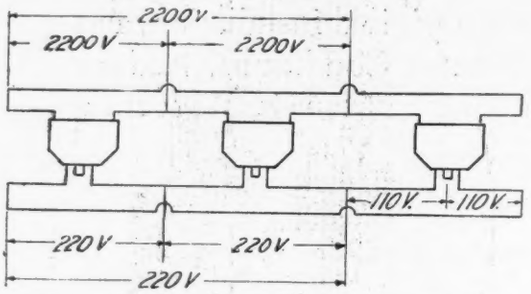
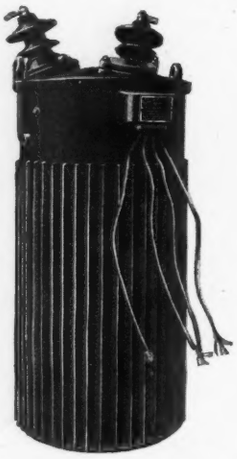


Diagram of Delta-Delta Transformer Connection.

them have exactly the same ratio as the others. If there should be any difference in the ratio of the transformers connected in closed delta there will be a circulating current in the delta connection, depending upon the difference of the ratio. I might add that 3% variation in the ratio would cause nearly a full-load current in the delta connection. It is always advisable when possible to use transformers manufactured by one company when a closed delta bank is used, because the different manufacturers build transformers with different characteristics. It is also necessary if trouble is experienced in connecting transformers in closed delta to check the polarity and ratio. Transformers built by one manufacturing company will often have a different polarity from those built by another. That is to say, one company will have a subtractive polarity and another company an additive polarity.

One of the greatest problems regarding trans-



Type of Transformer for Service in Small Sizes on 22,000-Volt Lines.

formers on a distributing system is to know the load conditions under which they are working. The writer can recall one 5-kw. transformer found with four ranges connected to it. In several districts where the same transformer has been in service for at least 10 yrs. the number of customers has been doubled and no test ever made to determine the exact peak load on the installation. It is believed that this condition accounts for a large percentage of transformer failures.

A systematic test to determine the peak load on lighting transformers can be made by using a split-coil current transformer and portable curve-drawing ammeter. The expense involved would be nothing compared with the loss of a transformer, to say nothing about the loss of revenue and the complaints because of interruptions to service. I might add that a transformer operating with a heavy overload will have poor regulation, and a large percentage of the complaints regarding low voltage will be eliminated if the transformers are not overloaded.

Attention should be given to the practice of connecting transformers for 110 and 220 volts, 3-phase; also taking lighting from a power bank of transformers connected for 220 volts. With transformers connected for 220 volts and a power load it is often that a 110-volt circuit is taken from the same bank, and in the majority of cases all of the 110-volt load is taken from only one-half of the winding of one transformer. It always should be taken into consideration that the 110-volt lighting taken from one-half of one transformer in a power bank has a tendency to overload that particular transformer if the bank is nearly loaded with power.

Quite frequently transformers are connected in parallel although this practice is not as general as might be expected in view of the advantages obtained from such operation. This attitude is probably due to the trouble experienced in restoring service after a local interruption, but these difficulties are usually caused by indiscriminate banking of transformers without sufficient study being made to secure a reliable and workable layout. In order that the advantages of banking transformers may be more fully appreciated they are enumerated below:

The transformer's capacity required when the transformers are banked is less than when they are operated individually, due to the better diversity factor of the combined load. The banking of transformers usually makes it feasible to use fewer transformers of a larger size, which means a decreased cost per kilowatt for transformers with a higher efficiency. The operating of transformers in parallel usually results in better voltage regulation through the network. The number of local interruptions is reduced when transformers are properly banked, because other transformers carry the load when one transformer goes out of service for any reason. In banking transformers great care should be exercised to see that the ratio is the same with both transformers. I recall one instance where a 10 and a 7.5 kw. transformer were connected in parallel, with the 7.5-kw. unit on the 6600-volt tap and the 10-kw. unit on the 6000-volt tap. This error in banking was the cause of a long interruption and the loss of a 10-kw. transformer.

The protection of transformers due to overload is important, and the capacity of fuses as furnished by the engineering department should be followed, and if a transformer so protected will not operate under these conditions an investigation should be made and the trouble corrected before increasing the size of fuses. Considerable trouble has been experienced in the past with the fuse carriers in the 6600-volt fuse boxes burning in

two and setting fire to the fuse box. This it is believed due to single-strand fuse wire being used in the carriers. To eliminate this trouble we are now carrying special fuses of all capacities in stock. I might add that during the year of 1920 there was shipped from stock upward of 300 fuse carriers, which represent approximately $300. A large proportion of the $300 could have been saved if consideration had been given and the correct fuse to be used in the carriers. The fuses which we are supplying have a slight increase in cost over the old method of fusing, but it is believed that the increased cost of the new style fuse will be very small considering the cost of renewing fuse carriers and the old fuse wire.

Great care should be exercised in using fuses to see that the different capacities are in separate containers so that the man using fuses can readily determine their capacity. It is impossible for one to tell the difference between a 2 and 3-ampere fuse, although I understand there are some linemen who claim to be able to determine the capacity of fuse wire by handling. I can recall, also, several instances where the lineman would have three or four small coils of fuse wire in his pocket and claim he could tell you at once the amperage capacity of each coil of fuse wire. I do not believe his guess would be correct in every case.

During the year 1920 there were in service 3929 customer's transformers on our system. During the same year approximately 70 transformers failed from various causes. These 70 transformer failures represented a loss of about $8000, not taking into consideration the loss in revenue and the time and expenses involved in replacing them. I am unable to give any definite information regarding the cause of these failures, but I believe that approximately 75% of the failures were due to insufficient protection; in other words, over-fusing. The present fusing schedule furnished by the engineering department gives a transformer a protection at about 150% overload, and you can readily see that if some consideration is not given regarding the load on a transformer it is found to fail from an overload and the failure is usually at a time when the transformer is most needed.

Proper Records to Provide for Elimination of Causes of Transformer Failure.

The writer would like to see a new form of transformer card adopted, whereby all information is shown; such as connected load, normal load, peak load, size of fuses, date of renewal of fuses, date of fuse blown, the cause of fuse blowing, date of transformer inspection and when filled with oil, and date of transformer failure and the cause. These records should be kept so that an annual report could be made and the case of failures determined and steps taken to remove the cause in a majority of cases. I believe steps of this kind already have been taken with nearly all other apparatus on our system.

The annual inspection of distribution transformers in each territory should consist of the following: First, a sample of oil should be taken from the bottom of the tank. This can be done by removing the small pipe plug in the bottom of the tank. If this sample of oil appears to be dirty

Single-Phase, 60-Cycle, 5-Kv-A. Transformer for 11,000 and 13,200-Volt Rural Lines.

or thick from a deposit, or contains any amount of moisture, the oil should be removed and the tank filled with new oil. Second, the oil in all transformers should be brought up to the proper level. Third, both the primary and secondary bushings should be carefully examined and any that may appear to be cracked or in any way defective should be replaced. Fourth, the primary bushings should be carefully wiped. Fifth, the outside of the tank should be scraped so as to remove the deposit of dirt, thereby increasing the radiation of the transformer. Sixth, the transformer numbers should be restenciled if necessary. Seventh, the transformer records should be checked with the installation as found. Eighth, all primary fuses should be removed, without fail, and the transformer should be refused in accordance with standard blue print. I believe that this condition is now cared for in nearly every district, and I am sure has had a great deal to do with eliminating a number of failures and interruptions to service.

SAFE OPERATING TEMPERATURES FOR UNDERGROUND CABLES.

Life of Cable Depends on Time of Operation at High Values—Duct Arrangement and Construction as an Influence.

By Wm. A. Del Mar,

Chief Engineer, Habirshaw Electric Cable Co., Inc., Yonkers, N. Y.

Underground power cables are necessarily operated at a much lower temperature than any other kind of electrical apparatus. This is due to the fact that the materials used for insulation deteriorate or are actually destroyed by continued subjection to temperatures of about 100 deg. C., the rate of deterioration being proportional to temperature and time. Impregnated paper insulation is the type now most generally used for

underground transmission and distribution cables because it is capable of withstanding higher temperatures and is cheaper than other materials, and has low dielectric losses. The operating temperature depends on voltage, current, number of ducts containing loaded cables, thickness of concrete surrounding the ducts, and the nature of the soil. The last three of these factors determine the heat dissipating possibilities of the system.

The standards of the American Institute of Electrical Engineers give the temperature ratings of paper insulated cables at 85 deg. C. minus E, in which E is the voltage of the cable expressed in kilovolts. The American Institute of Electrical Engineers made a study of the temperature ratings of paper insulated cables at the mid-winter convention in New York in February, 1921, when this question was very thoroughly discussed and considerable operating and experimental data presented. Among the most important facts brought out was that under certain operating conditions engineers have found that the above temperature limit may be exceeded for short periods without undue risk. For instance, paper cables may be operated at temperatures as high as 100 deg. C. for, say, 30 min. per day if the temperature is low for the rest of the day, or at 90 deg. C. for 2 hrs. a day with a low temperature for the rest of the 24 hrs. In other words, the maximum allowable temperature depends on the portion of the day for which it is applied and on the temperature obtained during the remainder of the day. Low-voltage cables may be safely operated at a higher temperature for longer periods than high-voltage cables, as partial deterioration of the paper is not so serious at low voltages.

Sometimes it is more economical to overload cables or certain portions of cables for short periods, as in large banks of ducts near power stations, even if by doing so their life is shortened than to provide enough cables to keep within the temperature specified by the rule at all times. The concensus of opinion still is, however, that the present rule limiting the temperatures of paper cables to 85 deg. C. minus E should still stand, and that although higher temperatures are evidently justified under certain conditions it should be left to the discretion of individual operating engineers governed by their own particular conditions.

MOTOR DRIVE FOR ROLLING MILL ON PACIFIC COAST.

Increased Capacity Provided for by Installation of Modern Motor-Driven Equipment in Existing Plant.

The Pacifice Coast Steel Co., which operates steel works at San Francisco and Seattle, recently completed the installation of new equipment at its Seattle plant whereby its capacity is greatly increased. This new equipment consists of a continuous-type furnace, two rolling-mill units and accessory equipment. The furnace, which serves the new rolling mills, is of the company's own design. It is 72 ft. long and 11 ft. wide, and uses fuel oil for producing the high temperature required. The steel billets which make up the furnace charge are delivered at the feed end by a Shaw 5-ton electric crane, and are then handled by a mechanical charging device.

The new rolling-mill equipment consists of five stands of 12-in. rolls and four stands of 16-in. rolls, the two units being driven by an Allis-Chalmers 1000-hp., 2200-volt, a-c. motor. The motor is direct-connected to a solid steel driving shaft for the first three stands of 12-in. rolls. There is also mounted upon this shaft a 66-in. sheave wheel having 25 grooves for a rope drive by which the four stands of 16-in. rolls are operated. The corresponding sheave wheel for the 16-in. unit is 132 ins. diam., the drive of strands of 1-in. Manila rope being 60 ft. between centers. Mounted upon the outer end of the same shaft that carries the 132-in. sheave wheel is a 75-ton flywheel. The speed of the 12-in. rolls is 187 r.p.m., that of the 16-in. rolls being 90 r.p.m.

Bearings for the main 15-in. driving shafts are of the closed dust-proof type furnished by the Dodge Sales & Enginering Co. by whom the sheave wheels and rope were also supplied. The 12 bearings and sheave-wheel blocks are supported by concrete foundations of mill-type construction. The two 12-in. finishing stands at the small end of the 12-in. rolling mill unit are operated by a Westinghouse 300-hp. d-c. motor. In addition to the above the company is installing two stands of 8-in. finishing rolls to be driven by a General Electric 500-hp., 2200-volt, 440-r.p.m., alternating-current motor.

Modern Equipment Provides for Production of Variety of Output.

All stands of rolls are adjustable to the requirements in shaping the red-hot steel for the numerous products such as angles, channels, I-beams, round and flat bars, and deformed steel for reinforcing. Changes of rolls for adaptation to the various purposes are made by the aid of a 7.5-ton electric crane. The cooling bed for the products of the new mills is an interesting feature of the plant, and represents designs and methods of handling evolved by the company. This equipment consists of a concrete structure 200 ft. long and 20 ft. wide, the top of which is on a level with the rolling mill floor. Steel rails about 1 ft. apart were laid transversely from side to side for the full length of the bed, and this constitutes the cooling surface. A sunken floor about 8 ft. below the cooling surface also extends the full length of the bed and gives room for two lines of electrically operated eccentrics by which the heated bars on the cooling frame are shifted from side to side. There are live rolls for moving the material first to the cooling bed and then away from it to the cutting shears and to a platform where the metal is ready for discharging into yard cars.

A Champion 7.5-ton electric crane, having a run-way extending from the new rolling-mill units to the farther end of the cooling bed, serves to handle finished material, for changing rolls and for handling heavy equipment. Electrical energy required for operating plant equipment is supplied by the Puget Sound Power & Light Co., the greater part of the load requiring alternating current. However, d-c. energy is used for a few motors, the cranes and trolley lines being supplied by a 500-hp. motor-generator set.

To Develop Hydroelectric Project on Kings River

San Joaquin Light and Power Co. Has Plans for Building Four Storage Reservoirs and Eight Power Plants—Long Tunnels to Be Built in Connection with Canals and Penstocks at Powerhouses

The San Joaquin Light & Power Co., Fresno, Cal., has had surveys and preliminary plans made for extensive power development on the north and west forks of Kings river. That stream with its several branches drains a section of the western slope of the Sierra Nevada range and flows westerly into the San Joaquin valley in the vicinity of Fresno. The runoff on Kings river is so rapid that without adequate water storage the possibilities of power development would be limited practically to those of the minimum runoff. Therefore, under the plans outlined, it is proposed to construct dams for creating four main reservoirs—two on the North fork and two on the West fork. Capacities and elevations of the proposed reservoirs are shown in an accompanying table.

Development on North fork will be undertaken first. This will consist of the construction of two main reservoirs to be known as Helms lake and Wishon lake, and the installation of a power plant tributary to each reservoir. It will include also the installation of Haas power plant to be served by the water to be diverted from the stream below Wishon lake. The Helm creek development requires 2.5 mi. of tunnel, 3000 ft. of penstock, and the installation of a hydroelectric plant of the capacity of 50,000 hp. The Wishon lake development contemplates the construction of a dam and the equipment of a power plant of 8000-hp. capacity. The Haas development will require 8 mi. of tunnel and 6500 ft. of penstock, leading from a dam below Wishon lake to Haas powerhouse in which generating equipment of 100,000-hp. capacity will be installed.

At the junction of North fork and West fork is the site of the proposed Balch development. Plans for this provide for taking water from both forks. In each case it will be diverted into a tunnel, the two tunnels coming together and discharging into 6000 ft. of penstock leading to the powerhouse. About 9.5 mi. of tunnel will be required. The power plant is to be equipped with generating units equal to 150,000 hp. Other

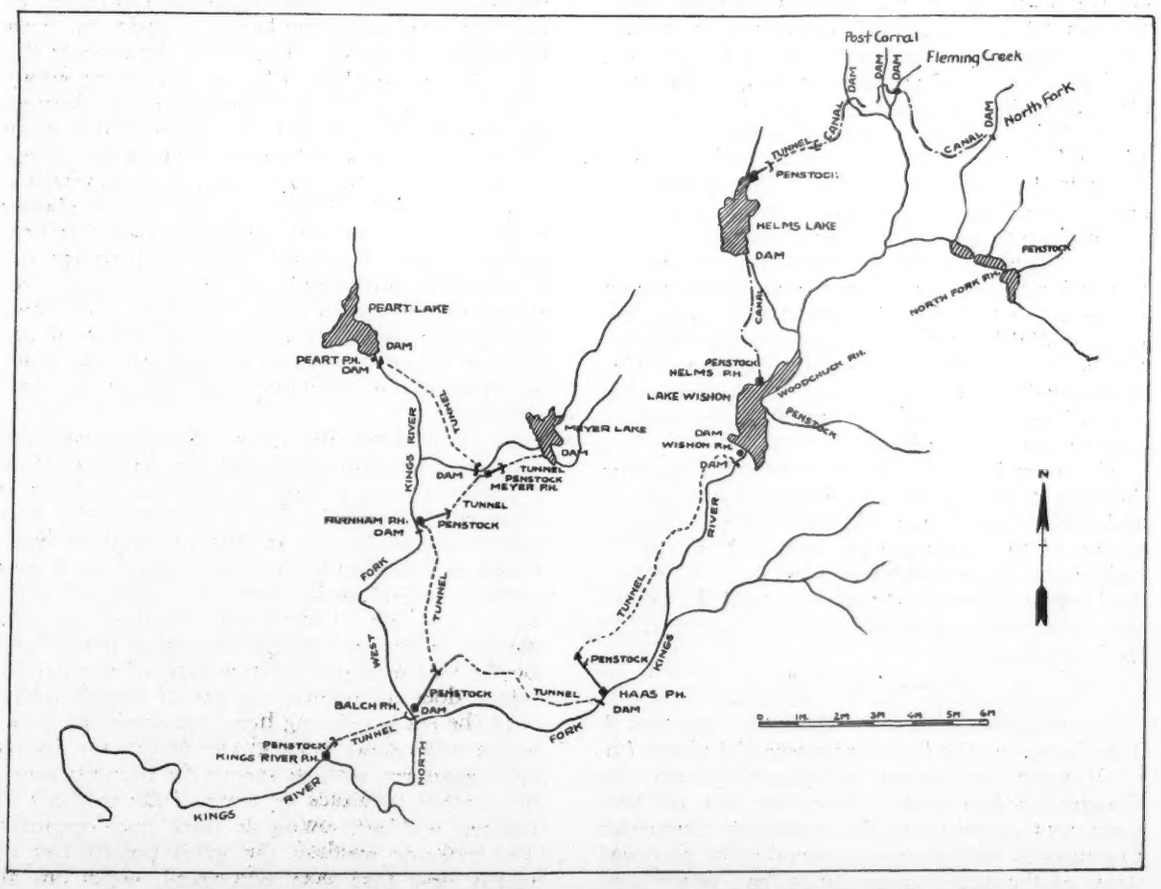


Diagram Showing Features of Developments on North and West Forks of Kings River.

work planned is the construction of diversion dams on the upper course of North fork, and on Fleming and Post Corral creeks, diverting their waters into a tunnel leading to Helms lake.

Development on West fork, which will be undertaken after the completion of that on North fork, will consist of the building of a 4000-hp. plant below the Peart lake dam, the diverting of water from Meyer lake through 1.25 mi. of tunnel and thence through 2500 ft. of penstock to the proposed power plant of 7000-hp. capacity. Another West fork project to be taken up later will be the Farmham development farther down stream. This will require 6 mi. of tunnel and 4500 ft. of penstock, conducting water to a power plant of 30,000-hp. capacity.

TABLE SHOWING ELEVATION AND AREA OF KINGS RIVER STORAGE RESERVOIRS.

Reservoir.	Elevation in feet.	Capacity in acre-feet.
Helms Creek	8150	110,000
Meyer Lake	6840	21,000
Lake Wishon	6450	45,000
Peat Lake	5630	54,500

The development of 25,000 hp. on Kings river below the forks is also contemplated. This will be accomplished by driving a 4-mi. tunnel from a point on the river below the Balch power site to the proposed Kings river site farther down stream. This will require 1300 ft. of penstock.

Railroad Construction Required in Advance of Power Development.

One of the first essentials in undertaking the developments on North fork at Helms lake, Wishon lake, Haas, Balch camp and on Kings river proper is the construction of 55 mi. of railroad to afford transportation facilities. Railroad plans provide for building a standard-gage line from Piedra to Balch camp, a distance of 31 mi., Piedra being at the Kings river terminus of a Santa Fe branch from Reedley. Then a narrow-gage railroad 24 mi. in length is to be built from Balch camp to the Helm creek power site.

The company's main substation, to which power lines from the San Joaquin river plants connect, is situated at Sanger, which is 34 mi. west of Balch camp and about 18 mi. east of Fresno. The company's generating capacity is now equal to 123,000 kv-a., its hydroelectric plants having a capacity of 83,000 kv-a. and its steam plants 40,000 kv-a.

The annual increase in the company's load for the last 10 yrs. shows an average of between 25 and 30%. In 1910 its total power output amounted to 23,000,000 kw-hrs., and by 1920 it had increased to 268,000,000 kw-hrs. For data used herein the writer is indebted to B. F. Jakobsen, designing engineer for San Joaquin Light & Power Co.

Consolidation of the Cumberland Telegraph & Telephone Co., the East Tennessee Telephone Co. of Virginia, the Bristol Telephone Co. and the Chesapeake & Potomac Telephone Co. of Virginia was proposed to the Interstate Commerce Commission recently for approval. The proposed name of the new corporation is the Consolidated Telephone Co.

SEA-WATER RADIATORS EMPLOYED ON ELECTRIC SHIPS.

Much Space Saved and Added Protection Results From Elimination of Air Ducts and Openings in Navy Vessels.

By J. W. Hammond.

A unique application of the automobile radiator principle to the electric drive for warships brought about a revolution in one phase of electric ship propulsion. The new scheme, which will probably be used on all large vessels electrically driven, has to do with the ventilation of large electrical units. Its chief merits from a naval point of view are that it makes the vessel more sea-worthy, allows the defensive armor of the ship to be strengthened, and provides for the recirculation of clean air at all times.

Twelve great naval vessels now under construction—six battleships and six battle cruisers—will embody the new feature in their equipment. All of these vessels are to exemplify the electric drive, now proven entirely successful in the battleship *New Mexico* and other ships. The radiator method of ventilating the electric propulsion apparatus on vessels is a clever, yet simple, adaptation of a principle long used by motor car manufacturers. However, it has been made to work in exactly the reverse order from its application in the automobile. As all automobile mechanics know, in the automobile radiator the heat is transferred from the water to the air. The water is the cooling element and is itself cooled by the circulating air. In the application of the radiator method to the ventilation of electrical machinery the heat is transferred from the air to the water. The air is the cooling element, being cooled itself by the circulating water.

By this system of recirculating cool air through the motors and generators the heat which is given off by the machine in producing electrical energy is conducted by the air to the resistors, where it is absorbed and carried away by the circulating water. It is extremely important that this heat be dissipated. Electrical engineers long ago devised a system of supplying cool air to large electrical units by means of a set of ducts. Air flows through an incoming duct to the electrical apparatus where it becomes heated and then flows off through an outgoing duct, taking the heat with it.

It is obvious that for electrical machines capable of developing 180,000 hp., as installed on a battle cruiser, a large amount of cool air is required. To supply this by means of the duct system a considerable amount of valuable space would be taken up by the ducts which must pass through several decks from the machinery space to the open air. Dotted with the duct openings the ship is less protected from mishap than would be the case with the radiator type of ventilation, which does not require the use of outside ducts.

If the sea is running high in a storm sea water might wash down through the ducts. Or during an engagement with an enemy the warship would be exposed to attack by some of the methods of modern warfare, owing to these duct openings. The radiator method, the great possibilities of which have just been announced, wipes out all these disadvantages. The heated air is circulated

by means of fans through the radiators. There the air passes over a number of tubes through which sea water is circulating. The water in the tubes cools the air which continues on its way back to the electrical apparatus where it again receives heat from the generator or motor and is then carried again to the radiator for a repetition of the process. No ducts pass out to the open air to endanger the ship in heavy seas; nor are there any openings in the deck to endanger her in battle—the armored deck can be extended unbroken from stem to stern, except for openings necessary for the ordinary ventilation of compartments.

The whole process is one of repeated heat transfer. The heat is first transferred from the electrical apparatus to the air, then from the air to the water. A new supply of cool water is continually pumped through the radiator tubes from the sea and the heated water passes back into the sea. The radiator principle, worked out for electric ship propulsion units, will cool the air 35 deg. F. Passing into the radiator core at a temperature of approximately 135 deg. F. the air will pass out again at a temperature of 100 deg. F. This temperature has been found satisfactory for air supplied to electrical apparatus for cooling.

Cooling units, or radiators, take up but little space. Each one is 30 ins. long, 20 ins. wide, and 7 ft. high. The engineers have made possible reserve ventilation facilities by designing the radiators in sections. Each motor will have 12 sections and each generator 16. This is a generous margin over the number of sections actually needed for cooling the apparatus, so that if one of the radiators is temporarily disabled by leaky tubes or other causes, necessitating that the water valves be closed, the work will be carried on by the others. This also will provide for greater ventilating power when the vessel is in tropical regions where the sea water is warmer than it is in northern latitudes, often reaching 85 deg. F.

In the case of the generators the radiators are built integral with the machine and are entirely inclosed by means of metal housing, thus providing a closed system of ventilation with the air circulated by means of fans on the generator rotor. This idea of a self-contained generator is in itself of unusual interest to electrical men. With the propelling motors the cooler sections are located adjacent to the machine, the air is circulated by means of external fans which draw the cool air through the motors and force the hot air through the radiators where it is cooled for recirculation. The radiator equipment that will be necessary for the entire 12 ships is 1200 sections. Each battleship will carry four motors and two generators, giving it an electric drive of 60,000 hp. Each battle cruiser will have eight motors and four generators, providing 180,000 hp. The battleships will need 40 cooler sections each, and the battle cruisers will require 160 sections each.

In the preliminary tests at the Schenectady works of the General Electric Co. the engineers took the radiator from a motor car for their experiments. The tests thus made demonstrated conclusively that scheme was feasible. More extensive work was then done with radiators of the type used in motor trucks. These tests sought to determine the rate of transfer of the heat from the air to the water. That enabled the engineers to work out the dimensions of the radiators for the sort of duty demanded in the cooling of electrical propulsion apparatus on ships. Numerous experiments were made and time and money spent to develop the idea to the point of efficiency which has now been attained.

INTERESTING FEATURES OF ENGLISH ELECTRICAL PROBLEMS.

Legal Obstacles and Labor Troubles Hamper Development and Increase Cost of Service to the General Public.

Mr. Llewelyn B. Atkinson, president of the Institution of Electrical Engineers (English), is perhaps best known to us as a pioneer in the development of the single-phase alternating-current motor. In his address to the Institution on the occasion of his installation Mr. Atkinson briefly touched upon the whole field of electrical science and industry. Much of what he said may not be of particular interest to readers of ELECTRICAL REVIEW, but in connection with the prospective developments in central power stations and electric transmission it is worth noting that the smallness of generating stations and the lack of cooperation and economical centralized production up to the present time in England are due largely to the Electric Lighting Act of 1882, "and what has been effected has been done in spite of and not by the help of legislation." Mr. Atkinson says "for 40 years we have worked in the wrong direction, and the task is indeed a most formidable one." The war has led to a broader outlook and clearer understanding of the industrial requirements of the nation, so that the era for larger power stations with transmission and distributive systems covering considerable areas is probably at hand. Although developments in underground cables are discussed, the omission of any reference to overhead high-voltage transmission is noticeable in this connection.

One of the greatest problems at the present time in England, as in nearly all countries, is the social and industrial unrest. Mr. Atkinson believes this to be due to the monotony of machine production combined with enough education partially to awaken the reason, but insufficient to "appreciate the beauty and triumph of what is happening." He believes that individual skill and enthusiasm must be utilized, and that it will ultimately be necessary to place part of the direct responsibility for management in the hands of the operatives.

In the *Electrician* (London) of Jan. 7, 1921, the progress in the electrical industry is briefly reviewed. Although the past year was not an entirely successful one, and the immediate future is not overly bright, it is pointed out that the gradual slackening of government control over trade will encourage development and lead to more stable conditions before so very long. The chief troubles which the industry has had to contend with are inability or disinclination of the consumer to purchase, because of the high prices, the slackening of productive effort coupled with the demand for higher wages, and the almost over-

whelming obstacle to development imposed by the high rate of the excess-profits tax.

Although on the manufacturing side of the industry progress has been slow and difficult the effects of the Electrical Supply Bill passed at the end of 1919 are beginning to be felt, especially in regard to the development, reorganization, and consolidation of electricity supply. The new legislation, intended to promote and facilitate important developments in the supply and distribution of electric light and power, is far from being in a satisfactory or final shape, the delay being due to the crowded state of parliamentary business, but considerable changes are to be looked for in the near future in the bulk supply and distribution of energy. Much attention has been paid to the possibilities of hydro-electric development, and the report of a committee of the Board of Trade is to the effect that there is a good deal more water power available in the British Isles for electricity supply purposes than is generally supposed.

The tramways industry in England has had its troubles, and the future outlook is not bright. Local strikes together with the constant demand for higher wages, and increased cost of materials, have resulted in a number of electric traction lines having been forced to allow their properties to degenerate into a very poor condition. The electric vehicle, on the other hand, has made satisfactory progress, but it is suggested that there is room for further education of the public in the advantages of this form of vehicle for certain kinds of traffic work, and also for improved battery-charging arrangements.

A Comparison of Electrical Practice in England and America.

While on the subject of the present trend in the electrical industry in England, it may prove interesting to consider wherein practice differs from our own. An excellent source from which information along these lines may be obtained occurs in the report of the Manchester Electricity Committee based on the observations made by their chief engineer, E. L. Pearce, while on a recent visit to this country.

Mr. Pearce is not only one of the leading electrical engineers in England, but the fact of his being also a Fellow of the A. I. E. E. suggests that he makes it his business to follow developments on this side of the water. His conclusions and recommendations are therefore of considerable value.

In the first place, Mr. Pearce finds that apart from size the general design and layout of modern American power stations does not differ materially from the latest British practice. British engineers, it appears, are able to show higher steam-turbine operating efficiencies than are generally obtained here.

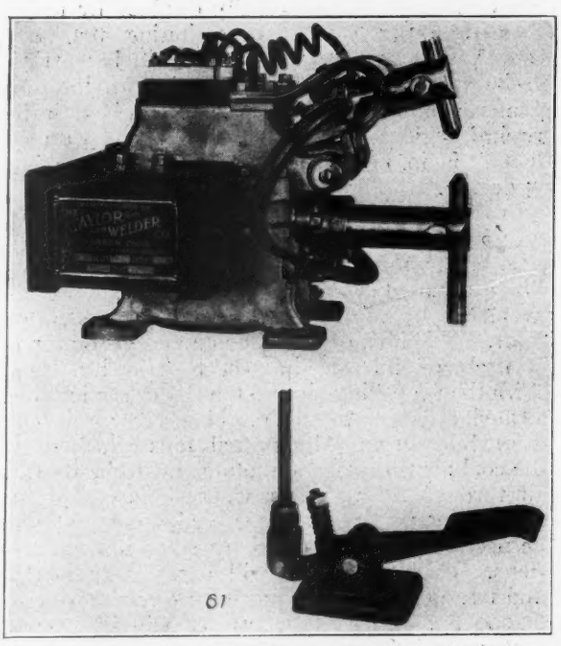
Boiler pressures have not been used in England much in excess of 250 lbs. per sq. in., while the tendency here is toward working pressures of 350 lbs. and even higher. Mr. Pearce was impressed by the possibilities of increasing the thermal efficiencies of the boiler plants by adopting pulverized fuel even in connection with existing types of water-tube-boiler furnaces. It is probable that he was also impressed by the extensive use of overhead lines for transmission pressures of 20,000 to 220,000 volts and also for distribution in the cities. The use of underground cables is far more common in Europe than on this continent, where they are rarely used for pressures in excess of 23,000 volts. A point of considerable interest is that the service pressures of supply, both alternating and direct current, are approximately twice as great in England as they are here.

BENCH TYPE SPOT WELDER FOR LIGHT WORK.

The Taylor Welder Co., Warren, O., is building and marketing the bench type of spot welder illustrated herewith. This machine has a capacity for welding two pieces of No. 30 to 16-gage sheet steel, and is provided with an overhang of 4 ins., the maximum movement of the upper electrode being 1 in., and the distance between horns when closed 3 ins. when in its upper position, and 5 ins. when in the lower position.

The machine is made with a cast-copper frame which acts as secondary, and also provides for greater efficiency during operation. The lower horn is made adjustable by drilling three sets of holes in the base of the frame and setting horn to suit the work to be performed. A long electrode is supplied below to meet such requirements.

The machine is especially designed to do light work such as welding, brazing and soldering, and is particularly recommended for spot welding light gages of sheet steel, cross-wire welding, contact points of platinum or tungsten to steel, brazing and soldering of small parts of electrical instruments, watch cases, optical goods and the



Taylor S-4-B Bench Type Spot Welder.

welding of gold to German silver or steel, also small laboratory work.

Operation is by means of a foot treadle. The equipment comprises one set of solid points and the floor space occupied is 10 by 17 ins.; the extreme height from bench is 12 ins.; from bench to welding dies, 6¾ ins.

EDITORIAL COMMENT

Customers' Transformers

On other pages of this issue appears an article by C. S. Knowles, superintendent of construction for the Pacific Power & Light Co. of Portland, Ore. This article was originally prepared by Mr. Knowles in the form of a paper read before a meeting of the district managers of the company in Portland some time ago, in which Mr. Knowles took up directly with these men a number of the problems encountered in the construction and maintenance of the company's general distribution system. This article, which is reproduced in substance from the Pacific Power & Light Co. *Bulletin* is worthy of careful study because of the fact that it has been prepared by a man particularly qualified to discuss the subject handled for the immediate benefit of the men in charge of the equipment operated by the company which he represents. Other construction and operating men would do well to give this article careful scrutiny in order to determine what of Mr. Knowles' suggestions are particularly applicable to the work in which they are engaged.

Following the presentation of the paper a number of the managers present at the meeting offered suggestions and criticisms relative to certain statements made by Mr. Knowles. Certain of these discussions related to the practice of operating transformers in parallel. These discussions brought out definite criticisms of the practice of paralleling transformers, and Mr. Knowles agreed that paralleling was not to be recommended as a general practice. In replying to one of these criticisms Mr. Knowles said: "I wish to say that it was not my intention and neither do I recommend the operation of transformers in parallel. This subject was merely included in my paper for the purpose of getting the views of the various managers covering this subject, as I understand that a few of them are in favor of it and others do not like it."

In reply to a question as to how to determine moisture in oil Mr. Knowles offered the following suggestions:

"I wish to say there are several different methods. I will give them in rotation as the method has advanced from year to year. First, several years ago it was thought that the only way to determine moisture in oil was by filling a cup with oil and heating a piece of iron red hot and if there were a frying noise when the rod was plunged in the oil moisture was present. If not, the oil was supposed to be free from moisture. Second, several years later it was decided that by filling a clear bottle with oil and putting a small amount of anhydrous copper sulphate in the oil, which is in a powder form, if the copper sulphate turned blue moisture was present; if not, the oil was supposed to be in good condition. Third, the last and best method was by means of giving oil a high-voltage test, which was accomplished by the use of a standard testing outfit manufactured by several companies. This is done by placing oil in a test cup with terminals placed 0.1 in. apart, and oil that will withstand a potential of 15,000 to 20,000 volts is considered satisfactory for use in connection with transformers up to 25,000 volts, but with transformers with a higher voltage it is advisable to have the oil withstand a potential between 20,000 and 25,000 volts. There are customers' transformers now in operation on 2300 and 6600 volts, and for a rough test to determine if there is any moisture in the oil it would be satisfactory to merely take a sample of the oil in a small test tube or clean bottle and if there is any amount of moisture in the oil it will settle at the bottom and can be very readily detected.

Heating of Underground Cables

Ability to withstand the influences of heat is one of the factors governing the load carrying capacity of any piece of electrical equipment. This holds true for wires and underground cable the same as for motors, transformers or generators. In response to an inquiry D. M. Simons made the following comments relative to heating of underground cables:

"Underground cables for power transmission are necessarily operated at a much lower temperature than any other kind of electrical apparatus, if reliable service is to be insured, owing to the types of installation used and owing to the fact that the conditions of heat dissipation are much less favorable than in other types of equipment. To determine the allowable carrying capacity in a given system it is necessary to know the allowable temperature of the insulating material, the total amount of heat generated in the cable, and the heat dissipating characteristics of the system. If the amount of heat generated by a given current in a given cable or group of cables is known, and the thermal conductivity of the system has been determined, then the maximum temperature rise of the cable or cables may be determined, or vice versa, and for

a given permissible temperature rise the allowable current can be calculated.

"The allowable temperature of paper insulation has been standardized according to the rule of the American Institute of Electrical Engineers at 80 deg. C minus E, where E is the working pressure between conductors in kilovolts.

"The total amount of heat generated consists largely of the I^2R losses due to the flow of current through the conductors. In certain cases the dielectric losses in the insulation and the losses due to induced currents in the sheath should also be considered, but in general the total energy loss in the system which produces heating in the cable consists almost entirely of the I^2R losses in the cable or cables.

"A most difficult question to definitely determine is the ability of the system to dissipate the heat which is generated in the conductors. This heat flows outward from the conductors (which will be at the highest temperature) to the earth which will be the base temperature, causing a rise of temperature which may be divided into three parts as follows: (1) The rise of the conductors above the lead sheath; (2) the rise of the lead sheath above the ducts, and (3) the rise of the duct structure above the base temperature of the earth which is on an average about 20 deg. C. or 68 deg. F. The rise of the conductors above the lead sheath depends upon the thermal resistivity of the insulating material, upon what may be called a geometric factor, which depends on the size of the conductors, the insulation thicknesses, and the I^2R losses in the cable under consideration. The rise of the cable sheath above the temperature of the duct structure depends upon the losses in the cable, the diameter of the cable, and the physical condition of the lead sheath. If the diameter is large the surface which dissipates the heat is relatively large and the temperature rise will be low. In general, it may be stated that a bright sheath does not dissipate the heat so well as a dull sheath or one painted black. The rise in temperature of the duct structure itself depends upon the total amount of heat generated in the duct, and therefore upon the total number of cables in the duct and upon the ability of the soil which immediately surrounds the duct to dissipate heat, which varies within somewhat wide limits. The value is greater for wet soil and very low for dry sand or ashes.

"When all these factors have been determined it will be possible to calculate the temperature rise for any assumed number of watts generated as I^2R loss in the conductors. A comparison of this temperature rise with the allowable temperature rise will immediately indicate the allowable watts which may be generated, from which the allowable current can be immediately calculated. A great deal of study and research has been done upon the various factors which constitute the total thermal conductivity of the system, and sufficient data is now available to readily calculate the temperature rise of a given system and the allowable current."

Profits in Plug Fuses

Profits from retailing plug fuses to the consumer have been about as hard for the contractor-dealer to discover as was the honest man in the fable of old. Millions of plug fuses have been retailed in the past, but it is a difficult problem to figure just how a real profit can be made on sales of a dime apiece or possibly less. However, it appears that this situation is about to be changed to the mutual advantage of both the dealer and the purchaser—the dealer will be able to make a worth-while sale and the customer will get satisfaction for the money he spends.

The new merchandising plan has been launched by the Bussmann Manufacturing Co., St. Louis, Mo. The plan is quite simple, having had the elements of difficulty and complication eliminated by careful planning. A package is made up of 10 good fuses, with sufficient information printed on the carton to tell the user of the fuse what to do. The price of the package of 10 fuses is less than the cost to the customer of having a single replacement made, and in addition to the saving in money the customer is able to renew his own service without the inconvenience of waiting for the repairman in case nothing but a fuse renewal is required. From the point of view of the dealer the arrangement should prove almost ideal. The average purchaser of a plug fuse is in a talkative frame of mind and wants to tell the dealer about the inconvenience just experienced as the result of the fuse operation that made his trip to the store necessary. Out of courtesy the dealer must listen and must give some consolation, and what better consolation can he offer than a box full of proper sized fuses to be held as a guarantee against future inconvenience. The customer, in most cases, will prepare the way for the dealer to offer the package and will be more than willing to complete the deal.

This new merchandising plan has been tried out in certain sections of the country and is more than meeting expectations. Jobbers and dealers are meeting the plan with enthusiasm as they see in it a means of rendering a real service at a real profit. Central station men see in the new plan a means of avoiding many of the evil practices of the past, such as the use of copper wire, hair pins and pennies in the place of a fuse that has operated. With the success already attained, and with the favorable impression made, it seems evi-

dent that in the future plug fuses will be marketed to the consumer in packages and at a profit to the electrical trade.

Electrical Inspector Not a Teacher

Electrical inspectors are sometimes heard to complain that they are too often compelled to teach unskilled electricians how to do certain kinds of electrical work properly. They find that property owners and architects are often induced by the low figures at which such men are usually ready to undertake electrical construction to award contracts to men not fitted by previous training to do such work, and that thereafter the inspector has to spend time needed for other work in showing how the installation must be made in order to pass inspection.

This sort of thing became so annoying in one of the cities of the West not long ago that the city electrician was led to insert a statement in the electrical inspection rules of the city to the effect that his department would not longer engage in teaching incompetent men how to do wiring. This stand seems entirely justified, as the inspector's duty is covered when he points out what the fault is, without explaining how it may be remedied.

Aside from the annoyance to electrical inspectors of such a condition as this, it is most unfortunate for the property owner. It may and does sometimes lead to much unnecessarily extra work having to be done and paid for, and to awkward delays in getting the installation into service. Moreover, work once done improperly and then remodeled is generally far inferior in most ways to work done right initially.

When the electrical inspector finds a job in the hands of competent electricians he is not only able to give more time and greater care to his inspections, but he also takes pleasure in dropping an occasional valuable hint regarding an improvement that may be made here or there. The hints are greatly appreciated by the electrician who is glad to gain knowledge from one whose experience is necessarily widened through contact with many more and varied installations than his own. Thus the already competent electrician becomes more competent, the inspector is enabled to render more effective service—and everybody concerned is safeguarded to a higher degree.

Freight Rates and Electrical Construction

The long delayed and much needed extensions to practically every central station system in the country are waiting on one most vital factor—the opportunity to earn an adequate return on the investment. New money cannot be raised on a proposition that will not show a return within a reasonable period of time, and consequently many badly needed projects are delayed to the great detriment of the entire country. New construction means the employment of men and the purchase of raw materials, and so spells prosperity. But if we all sit idly by while the wheels of industry slacken and cease to turn because of the lack of vision to see beyond our own immediate surroundings where will the initiative come from to renew activity? The cost of construction is high and will probably continue high, or at least higher than it was a few years ago when the present properties were built.

Coal is the food of the central station. If coal is costly the central station must run on short rations, and the power users of the country must be content with a reduced supply of energy. The nation cannot advance without the aid of an increasing supply of power, so that prosperity can not be expected to return as long as the central stations are starved by abnormal and unreasonable coal prices. It is not our province to say where the price of coal should be cut, but we do know that freight rates are out of reason. Strikes, speculation in fuel, restricted production, high freight rates, or any other agency that tends to add another burden to the already heavy load carried by the central station industry are blows at the heart of our individual and national welfare. Every element of the electrical industry should recognize these facts and should bend every effort to correct existing conditions. At the present time high freight rates are a vital handicap to progress and they must be reduced. There is no question but that a reduction in fuel transportation rates would be followed by an expansion exceeding anything experienced in the history of the industry, and this expansion will be paralleled by an even greater expansion of other industries depending upon the central station for energy. This means a return of prosperity. You cannot afford to be idle in the face of what the future holds forth.

Good Appliance Trade

L. C. Phillips, manager of the Cheyenne Electrical Construction Co., Cheyenne, Wyo., sold 11 washing machines and 14 electric ironers during a recent 2-wks. campaign conducted by his company, according to a local newspaper. Mr. Phillips was quoted as saying:

"Many are talking hard times, but people have the money and they will buy if they are offered the right kind of merchandise at the right price. Never in the history of my company has business been any better than during the past fortnight."

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

WILL DISCUSS CREATIVE CREDIT MANAGEMENT.

Business Service and Problems Surrounding Municipal Accounts Among Subjects to Be Considered by Electrical Credit Association.

The 26th annual meeting of the Electrical Credit Association, Central Division, will be held at the Drake hotel, Chicago, Nov. 17-18. The business sessions will commence at 9:30 a. m. each day. The annual dinner will be held at 6:30 p. m. Thursday, Nov. 17.

Among the important subjects to be discussed during the convention will be the following: "Credits and Reconstruction," by E. V. Shepard, credit manager, Western Electric Co., New York City; "Accounting, Credit and Finance," by Stanley A. Dennis, New York City; "Supplemental E. C. A. Service and Interchange Bureau Data," by Henry Schwab, Monarch Electric & Wire Co., Chicago; "How I Believe Difficult Credit and Collection Problems Should Be Handled During These Critical Times," by W. E. Sargent, Cutler-Hammer Manufacturing Co., Milwaukee; "Problems Surrounding Municipal Accounts," by C. E. Vandel, Western Electric Co., Kansas City, Mo., and "Sample Credit and Collection Forms," by H. H. Pribbanow, Julius Andrae & Sons Co., Milwaukee.

Other subjects by speakers to be announced later are: "Business Outlook," "Cash Discounts," "C. O. D. Refusals," "Business Service," "Standard Accounting Methods," "Creative Credit Management," "Sales Manager's Viewpoint of Credit Department," "Education of Credit Men in Trade Development," and "Association Experiences, Perplexities and Results."

TUNGSTEN AND GAS-FILLED LAMP PATENTS UPHELD.

General Electric Co. Sustains Its Position as Result of Second Decision Covering Practically the Same Matters.

For a second time the Just and Hanaman tungsten filament patent and the Langmuir gas-filled lamp patent have been upheld as a result of court action. In a case just brought to a close Circuit Judge Julius M. Mayer in the U. S. District Court for the southern district of New York rendered a decision in favor of the General Electric Co. and against Nicholas Fabian, F. Alexander, and the Alpha Electrical Laboratories, Inc., of New York, according to information at hand. The decision was in part as follows:

"The patents and the art here considered were fully discussed in previous opinions of the Circuit Court of Appeals and of this court. * * * The bulk of the record is quite disproportionate to the simplicity of all but one of the questions involved. This extensive record is due in part to the fact that the court felt that the widest opportunity should be given to put forward almost any conceivable fact, experiment or theory directed against validity or infringement, as the case might be, in order that litigation in any event as to the validity of these patents should some day come to an end one way or the other. If in view of prior litigations it be ultimately held in this case that the claims of these patents are valid it is difficult to imagine what new matter can later be brought forth. * * * On the Langmuir patent there is not a shred of merit to the present attack of validity. The previous case was ably tried for the defense by experienced counsel who did not neglect anything of consequence. * * * In no case has fuller opportunity been accorded to a defendant and has more time been allowed to make experiments and prepare defenses, and yet notwithstanding the ingenuity and ability with which the Just and Hanaman American patent has been attacked it remains where it was and where it should be, the embodiment of an impregnable invention of the highest order."

ITINERARY OF LIGHTING EXHIBIT AND CONFERENCES.

Edison Lamp Works Conducts Industrial and Commercial Lighting Demonstrations With View to Selling "Better Illumination Idea."

So successful were the lighting conferences and demonstrations, or industrial and commercial lighting exhibits, which were held last winter and spring by the Edison Lamp Works of General Electric Co. in more than 70 of the leading distributing centers of the country, that they are again being conducted. A total of nearly 11,000 attended these demonstrations, and the result was not only the selling of the better illumination idea, but direct orders and prospects for the jobbers.

During October of this year the conference and demonstration was held in the following cities of New York state: Albany, Glens Falls, Amsterdam, Utica, Ilion, Rochester and Buffalo. The present plan is to have this exhibit continue into Ohio, Indiana, Michigan and Illinois, down along the Mississippi, across Tennessee and back to Harrison, N. J. It is expected that another booth and demonstrators will tour the New England states and New Jersey, starting early in November.

The methods followed are essentially the same as before. Demonstrations of various types of lighting units, ranging all the way from unshaded, glaring lamps to the latest, best and most efficient units, are given in a portable canvas booth. Thus, those who attended have an opportunity to judge for themselves the relative effi-

ciency and desirability of the different types, being aided by foot-candle meters which are distributed among them. A miniature show window forms part of the exhibit, and during the demonstration it is lighted with colored lights, showing the wonderful effects that may be obtained in show window illumination not only by the use of the primary colors, but by combinations of them.

Last winter and spring three booths, accompanied by demonstrators, were on tour, 72 cities in 23 states being visited, and the total attendance was approximately 10,800. About 75% of those attending were industrial executives—presidents, secretaries, purchasing agents, superintendents, etc., of industrial concerns; 10% were industrial men—foremen, electricians, etc.,—while another 10% consisted of representatives of civic concerns, such as chambers of commerce, boards of trade, Rotary and Kiwanis clubs, etc. The remaining 5% was made up of engineers, architects, teachers, students, etc. The demonstrations are given with the co-operation of the jobbers in the territory where they are held.

UNIFORM ESTIMATING SOUGHT BY ELECTRICAL CONTRACTORS.

Kenneth A. MacIntyre, member of the staff of the Society for Electrical Development, member of the executive committee of the National Association of Electrical Contractors and Dealers, and also chairman of the architect committee of the latter organization, is meeting with the various electrical estimating organizations in the different cities. He was in Chicago last week in company with A. L. Abbott, Cleveland, chairman of the cost data committee of the N. A. E. C. D., and Harry C. Turnock, Cleveland, member of the same committee.

In the western metropolis they met with the Electrical Estimators' Association of Chicago, and with the Electrical Contractors' Association of the same city, exchanging views and gathering data for the purpose of compiling a comprehensive plan of estimating for electrical contractors that will be based on the unit plan and be made applicable to large and small buildings alike. A report will be presented at an early date.

ARTISTIC VALUE OF ILLUMINATING GLASSWARE DISCUSSED.

Incandescent Lamp Industry and Uniform Cost System Among Subjects Presented at Cleveland Meeting of Illuminating Glassware Guild.

After an automobile ride from the Hotel Cleveland to Nela Park, the quarterly meeting of the Illuminating Glassware Guild held at the latter place, Oct. 19-20, was opened Wednesday morning with President C. H. Blumenauer presiding.

A hearty welcome extended by W. M. Skiff, manager, engineering department, National Lamp Works of General Electric Co., was followed by an interesting and comprehensive address by Col. Leonard P. Ayres, vice-president, Cleveland Trust Co., on "Price Changes and Business Prospects," wherein he began by explaining that business consists of relationships between prices of various commodities, services, etc., and that an accurate knowledge of price movements is necessary for the intelligent conduct of business. He concluded with a very clear picture of price movements for various goods from the beginning of the war to date both for this country and foreign ones. Graphic charts and curves, averages of wholesale and retail prices and final movements of prices on industrial stocks were also presented.

The few minutes preceding the adjournment of the morning session were devoted to a discussion of the present and possible future conditions of the industry. Business with the small dealer was reported not very good, while the stocks in the hands of the larger distributors were practically exhausted and the replenishing of them had caused the recent improvement in buying, but from now on actual consumption should be reflected in the business placed.

The afternoon meeting was opened by an address on "The Incandescent Lamp Industry" by S. E. Doane, chief engineer, National Lamp Works of General Electric Co. Mr. Doane explained how the various branches of the industry were dependent upon each other and could only develop together. Thus the market for lighting glassware will increase only as the development and transmission of power advance and as the business of lighting homes, factories, etc., expands. He then recounted in an interesting fashion the development of the incandescent lamp and its use in the lighting field.

The remaining hours of daylight were taken up by an inspection trip through the lamp and glassware divisions and the laboratories of the National Lamp Works of General Electric Co.

On Thursday morning, H. A. Couse, counsel, National Lamp Works of General Electric Co., in speaking on "The Legal Aspects of Association Work," explained the laws applying thereto and their legal interpretation.

"The Artistic Value of Illuminating Glassware" was the subject of the paper given by Dr. M. Luckiesh, director, applied science laboratory, National Lamp Works of General Electric Co., in which he emphasized the importance of the decorative factor in home lighting and discussed the opportunities for greater decorative effects and more variety of atmosphere being secured through proper lighting at less expense than any other form of decoration, but education of the householder is necessary.

In the afternoon the final draft of the uniform cost system was presented and briefly explained, with an account of how the system was evolved and its important principles and functions. The association unanimously voted for its adoption and installations in member plants will be begun at once.

W. F. Minor, as chairman, reported for the Merchandising Committee, and the report of the Standardization Committee was rendered by E. Y. Davidson. Then with a resolution of appreciation of the generous and cordial hospitality extended the members of the association by the officials of the National Lamp Works of General Electric Co., the meeting adjourned.

The following were in attendance during the

meeting: Garrett Bryce and William Nichols, U. S. Glass Co.; P. W. Jenkins, E. Y. Davidson and H. L. Lissfelt, Macbeth-Evans Glass Co.; John Beiswanger, Gill Bros. Co.; C. H. Tiebout, Jr., and Marshall T. Gleason, Gleason-Tiebout Glass Co.; W. F. Minor and H. R. Tait, Ivanhoe-Regent Works of General Electric Co.; E. A. Taylor, H. Northwood Co.; Frederick Carder, Corning Glass Works; Thomas R. Crock, Jeanette Shade & Novelty Co.; E. V. Fisher and I. J. Collins, Hocking Glass Co.; A. V. Beaumont and J. L. Edwards, Beaumont Co.; T. H. Howard, E. H. Peck, T. W. McCreery, A. H. Stewart and E. P. Ebberts, Phoenix Glass Co.; C. H. Blumenauer and L. O. Griffith, Jefferson Glass Co.; James and W. T. Gillender, Gillender Bros.; and C. R. Stevenson, C. H. Ferris, W. H. Guthrie and J. M. Dooher, Stevenson Corp.

TO DISCUSS ELECTRIC PROPULSION OF SHIPS.

The 29th general meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies building, New York City, Nov. 17-18. The afternoon session on Thursday, Nov. 17, from 2 to 5 p. m., will be devoted to a joint meeting with the American Institute of Electrical Engineers, at which the following papers will be presented: "Electric Propulsion of Ships" by W. E. Thau, general engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and "Electric Auxiliaries on Merchant Ships" by E. D. Dickinson, mechanical engineer, marine department, General Electric Co., Schenectady, N. Y.

ELECTRICAL EXHIBITS DISPLAYED AT MILWAUKEE SHOW.

Value of Electrical Goods Exhibited at 1921 Electrical Exposition at Milwaukee Auditorium Estimated at $150,000.

Electrical goods valued at $150,000 were exhibited at the 1921 Electrical Exposition held Oct. 25-31 at the Auditorium, Milwaukee. It is stated that this was the largest electrical exposition ever held in the Northwest in which one entire floor of the largest display hall in the Middle West was devoted to the exhibition of electrical goods and appliances. Some of the principal exhibits are briefly described in the following paragraphs:

The electric grill and kitchen contained a Westinghouse range, Westinghouse turnover toaster—"toast your own bread," Russell electric heating appliances and Benjamin 2-way plugs.

In the electric laundry Altorfer Bros. Co. washers and ironers were displayed.

Julius Andrae & Sons Co. exhibited a Westinghouse electric bake oven in booth 41, and also other appliances in booths 58, 60 and 61.

In booth 48 the Chicago Fuse Co. displayed its product.

The Milwaukee electrical contractor-dealers were represented in booths 53 and 54 and showed diagrams of an electric "servantless" home, emphasizing convenience outlets.

Polly Manufacturing Co. displayed its line of lighting fixtures in booth 56.

The 1900 Washer Co. exhibited its ironer and "1900" washer in booth 53 and other space occupied by it.

In booth 59 the Franco Electric Co. had an exhibit of batteries, flashlights, Christmas tree lighting outfits, etc.

Piepkorn Electric Co. occupied booth 64 with the Universal Utilities Corp. line of washers, ironers, etc.

In booth 65 the Milwaukee Washing Machine Co. was represented with an interesting line of its products.

Burdick Electric Co. had its line well displayed in booths 66 and 68.

Herman Andrae Electric Co. exhibited in booths 81, 82, 83 and 84 the "Little Giant" washer and other household appliances.

In booths 95, 96, 97 and 98 the Home Wiring Co. displayed a miniature house where convenience outlets were shown for lights, and a good plea was advanced for wiring the home right.

Milwaukee Manufacturing Co. had in booth 102 a portable hot water radiator, known as the "Electro-Boil" heating unit.

Apex Rotarex Co. exhibited in booth 104 a rotary double ironer with separate ruffler, together with other household appliances.

In booth 109 the Economy Fuse & Manufacturing Co. displayed the "Economy" line of renewable fuses.

E. A. Quarfot occupied booths 111 and 118 for his exhibit which included the Chapman folding ironing machine, "Abso-Clean" vacuum electric percolating washer and the "American Beauty" electric washer.

Western Electric Co. displayed in booths 114, 115, 116 and 117 an interesting line of dishwashing machines, clothes washing machines, laundry machines, ironing machines and other appliances.

Berthold Electric Co. occupied booth 120 with a full line of "Berthold" washers.

In booths 127 and 129 the Krech Electric Co. exhibited the "Reco" electric kitchen unit and various types of electric washing machines including the "Thor," "Laundry-ette" and the "Abso-Clean."

The "Sunnysuds" electric washer was shown in booth 128.

The "Maytag" aluminum washing machine was exhibited in booth 131 occupied by the Merchandising Service Bureau of the Milwaukee *Journal*.

Chas. Polacheck & Bro. Co. displayed in booth 139 some outstanding designs of modern lighting fixtures.

Majestic Electric Development Co.'s line of electric heaters was exhibited in booth 141.

Voss Bros. Manufacturing Co.'s "Sea Wave," model B, electric washer was exhibited in booth 144.

Federal Electric Co. displayed in booth 147 the "Federal" electric washer.

Viltor Manufacturing Co. showed a refrigerating machine in booth 148.

In addition to the above the "Cadillac" vacuum cleaner was exhibited in booth 85, and George Richards Co. displayed a line of 2-way plugs in booth 67.

The "Electrical Home" at the Milwaukee show was a bungalow with living room, diningroom, kitchen, two bedrooms and a bathroom. The

kitchen contained a Western Electric combination dishwasher and table, "Ohio" vacuum cleaner, Sorgel ideal motor, and "Ilg" fan. The bathroom contained a "Majestic" heater for wash basin and a Milwaukee Manufacturing Co.'s water heater for bathtub, and a "Majestic" electric radiator. The bedrooms contained a new idea for light at the head of the bed; also a Fitzgerald violet ray machine, American Electrical Heater Co.'s electric radiator, Westinghouse fan, Star vibrator and a Simplex heater. The house showed many convenience outlets, 3- and 4-way switches, floor lamps, artistic chandeliers, wall brackets, etc.

Many other interesting household appliances and devices were exhibited, but space will not permit the mention of each individual machine on display.

ELECTRICAL GOODS EXPORTS FOR SEPTEMBER.

The exports of electrical goods to foreign countries for September were valued at $4,878,883, compared with $7,308,093 for the corresponding month in 1920, or a decrease of $2,429,210. For the 9 mo. ending September, 1921, the total exports amounted to $81,349,928, an increase of $13,678,947 over the 1920 figures and an increase of $12,910,724 over the total for the 9 mo. ending September, 1919.

The following classified figures give the detailed data for September, 1921, compared with the corresponding month for the previous year:

Electrical machinery and appliances (except locomotives):	September, 1920	September, 1921
Batteries	$ 607,936	$ 271,232
Carbons	119,233	42,402
Dynamos and generators	461,673	855,419
Fans	70,489	21,129
Heating and cooking apparatus	95,986	95,699
Insulated wire and cables	635,641	270,145
Interior wiring supplies, including fixtures	241,042	55,761
Lamps:		
Arc	1,053	455
Incandescent:		
Carbon filament	4,402	2,448
Metal filament	244,047	76,187
Magnetos, spark plugs, etc.	271,177	66,109
Meters and measuring instruments	190,331	191,411
Motors	1,230,408	537,558
Rheostats and controllers	33,309	45,304
Switches and accessories	281,635	159,690
Telegraph apparatus, including wireless	38,093	65,563
Telephones	246,841	262,062
Transformers	208,493	353,033
All other	2,326,304	1,506,876
Total electrical machinery, etc.	$7,308,093	$4,878,883

OKLAHOMA TO REQUIRE ADEQUATE LIGHTING OF PLANTS.

Belief that many serious accidents are caused by defective industrial lighting, and that production of manufacturing establishments in Oklahoma could be greatly increased by adequate lighting, Claude Connally, state commissioner of labor, will in the near future adopt rules and regulations, requiring proper illumination of all workshops and manufacturing plants in Oklahoma.

Mr. Connally has recently returned from the meeting of the National Safety Council, held at Boston, where demonstrations of scientific industrial lighting were given. These convinced Mr. Connally that proper lighting of plants is not only beneficial to industries, but also to the working men and women. The statutes of Oklahoma require proper lighting of all workshops and plants, but this provision has not heretofore been enforced. The state labor department, under the statutes, is authorized to adopt rules and regulations governing safety and proper lighting of industrial establishments and for several years has been enforcing safety regulations. Proper lighting regulations are now being drawn up and they will be enforced by the factory inspection department of the state labor commissioner's office.

DEMAND FOR HIGH-LINE SERVICE IN OKLAHOMA INCREASING.

Oklahoma Gas & Electric Co. Making Rapid Strides in Direction of Extending Electric Transmission Lines Over the State.

There is an unprecedented demand for electric high-line service in Oklahoma, according to O. A. Jennings, manager of the commercial department, Oklahoma Gas & Electric Co., Oklahoma City. Mr. Jennings is negotiating with a number of cities and towns that have asked that electric high power lines be built to them. He has recently signed up on behalf of his company for extension of high lines to Hunter, Lamont and Billings, in Garfield and Noble counties. In these towns municipally owned electric plants have been abandoned, the citizens discovering that they could purchase electricity from high lines and secure a 24-hr. uninterrupted service at less cost than they could maintain such service with locally owned power plants.

Discussing the high-line situation in Oklahoma, Mr. Jennings said: "The time is coming when all of Oklahoma will be covered with electric high lines, carrying power to almost every city and town in the state from one or more big central power stations. These high lines will be owned by a number of different companies that will be connected in one big system just as the railroads in Oklahoma are now connected. When this time arrives, it will be possible to furnish cheap electric power to the most remote cities and towns of Oklahoma, and to give dependable service at all hours of the day and night. Many of the smaller towns in Oklahoma have discovered that they can purchase their electricity from high lines of existing central power stations and have it transmitted to their borders cheaper than they can manufacture their own power. A small municipal plant is installed and the growth of the town makes continued additions and improvements necessary, the cost of such installations finally mounting to a figure which considerably exceeds the cost of securing better service through high lines. The average town in Oklahoma owning a municipal plant is only able to support electric service during a portion of the day, while electric high-line service when connected with the town is always available with 24-hr. service." Mr. Jennings states that the average town can save approximately 25% by substituting high-line service for its local power plant, and be relieved of the continual worry and expense connected with maintaining a local plant.

The Oklahoma Gas & Electric Co. has made rapid strides in the direction of extending electric high lines over the state. This company now has

300 mi. of such high lines in Oklahoma. The high-line system is divided into two divisions, the western and the eastern. The western division high-line service extends out of the central power station at Oklahoma City south to Moore and Norman and northwest from Oklahoma City to El Reno, Dover, Waukomis, Hennessey, Bison, Enid, Garber and Covington. An additional 1500-hp. unit is being installed at Enid, which will serve as a base of more high-line extensions out of that city. The Covington-Garber lines serve the northwestern Oklahoma oil fields, many oil properties having adopted electricity for operating their leases. The eastern division transmission system starts at Drumright and extends to Bristow, Sapulpa, Kiefer, Mounds, Beggs, Slick, Bixby, Jenks, Haskell, Boynton and Muskogee. Power plants for this division are located at Drumright, Sapulpa and Muskogee. A line out of Drumright serves that portion of the eastern Oklahoma oil fields. Slick was connected with high-line service recently and construction of a line into Yahola, Muskogee county, has just been completed. In addition to the high-line service being furnished by the Oklahoma Gas & Electric Co. several other Oklahoma electric companies have extended high lines out of their central plants, including the Public Service Co. of Oklahoma, the Washita Electric Power Co., the Oklahoma Power Co., the Consumers Light & Power Co., Oklahoma Power & Transmission Co. and the Choctaw Power & Light Co.

ELECTRICAL SUPPLY JOBBERS TO MEET IN CLEVELAND.

Announcement has been made that the adjourned meeting of the Electrical Supply Jobbers Association, Atlantic Division, will be held in two sessions at the Hotel Cleveland, Cleveland, Nov. 29. The morning session will open at 10 a. m. An interesting and instructive program is being prepared and Division Secretary E. Donald Tolles hopes that every member of the division will be in Cleveland for the meeting.

WAUKEGAN CONTRACTORS PLAN TO HOLD ELECTRICAL SHOW.

Electrical contractors of Waukegan and officers of the Public Service Co. of Northern Illinois held a conference and dinner at Waukegan, Ill., recently, and made plans for holding an electrical show at the Waukegan armory Nov. 14-19. The principal object of the meeting was to bring about closer co-operation between electrical contractors of Waukegan and to stimulate electrical business in the community.

ELECTRIFICATION OF LACKAWANNA RAILROAD.

The Lackawanna Railroad Co., 90 West street, New York City, is developing plans for the electrification of a section of its Scranton division, following preliminary investigations and study for some time past. The carrying out of the project is now said to be entirely dependent upon the cost and estimates are being secured for different features of the work to compute the aggregate investment. Foremost among the cost factors is that of electric locomotives, and these are to be of a type suitable for heavy hauling over mountain grades.

Cost estimates have been obtained also for electric power supply from existing and proposed central stations in this district capable of carrying the load; an alternate plan is said to provide for company power plants for individual service. The proposed project, when under way, will be followed closely by the electrification of certain portions of the road in New Jersey, particularly the main line, known as the Morris and Essex division, in the eastern part of the northern section of the state. Preliminary plans and different features of the work are being carried out at the office of Gibbs & Hill, consulting engineers, Pennsylvania railroad terminal, New York City.

RADIO ENGINEERS MEET.

The feature of the Nov. 2 meeting of the Institute of Radio Engineers, held in the Engineering Societies building, New York City, was a paper on "The Piezo-Electric Resonator" presented by Prof. W. G. Cady of Wesleyan University. This new type of electro-mechanical oscillator and resonator was explained, together with its action as a wave meter and radio-frequency stabilizer.

DISCUSS ILLUMINATION PROBLEMS.

An address by Preston S. Millar on "The Value of a Knowledge of Illumination Principles to the Electrical Industry" was the feature of a joint meeting of the Electrical Conference with the Illuminating Engineering Society held in Philadelphia Oct. 27. The Commercial Section of the National Electric Light Association and the Electric Club of Philadelphia were also invited by the Electrical Conference to attend the meeting.

COMING CONVENTIONS.

Electrical Credit Association, Central Division. Annual convention, Chicago, Nov. 17-18. Headquarters, Drake hotel. Secretary, Frederic P. Vose, 1343 Marquette building, Chicago.

Society of Naval Architects and Marine Engineers. Twenty-ninth general meeting, 29 West 39th street, New York City, Nov. 17-18. Secretary-treasurer, Daniel H. Cox, 29 West 39th street, New York City.

Electrical Supply Jobbers' Association, Atlantic Division, Cleveland, Nov. 30-Dec. 2. Headquarters, Hotel Cleveland. Secretary, E. Donald Tolles, 52 Broadway, New York City.

American Institute of Chemical Engineers. Fourteenth annual meeting, Baltimore, Dec. 6-9. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

American Building Exposition, new Cleveland Auditorium, Cleveland, Jan. 4-14. Assistant manager, R. G. Collier, 1305 Schofield building, Cleveland.

Western Association of Electrical Inspectors. Annual convention, Chicago, Jan. 17-19. Headquarters, Hotel Sherman. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

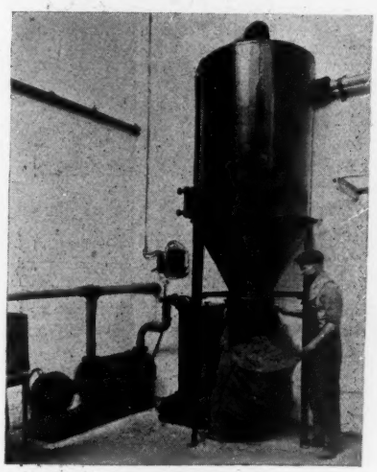
National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 231 Gordon Square building, Cleveland.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

Advantages of an Effective Dust Removal System.

A gradual realization on the part of manufacturers of the hazards and dangers inherent in accumulated or suspended dust has led to the necessity of developing proper apparatus for its removal and the creation of a new distinct branch of engineering, that of scientific pneumatic dust and litter removal.



Sturtevant Vacuum Cleaning System.

Dust collecting is simply the handling of suspended or floating dust and is really ventilation, but dust removal has to do with static or settled dust and no standard apparatus will meet all conditions since the factors to be considered vary. Therefore, each problem requires separate study and specific solution.

The engineering concern of Allen & Billmyre Co., Grand Central Palace, New York City, who, within recent years has specialized in and become experts on the subject of pneumatic dust removal systems, reports many interesting facts on the reduction of danger and money saved as the result of the installation of such systems.

The factory of the J. E. Barbour Co. in Paterson, N. J., where linen and cotton threads, flax yarn and twine are manufactured, in a case in point. Here such materials as flax, dust and fiber accumulated rapidly each day on the wooden and concrete floors around the machines and made conditions under foot and in the atmosphere above most injurious to the employes, while the dust and lint which had collected thickly on walls, pipes, ducts, window ledges, etc., were a menace to health and life.

A year or two ago the operators of this factory realized the seriousness of the conditions and a Sturtevant vacuum cleaning system, consisting of two deposit tanks, a 5-hp. motor-driven multistage fan and the necessary piping, as recommended by engineers after thorough study of the situation, was installed. Today the Barbour company states that the general interior appearance of the factory was immediately improved, production increased and the simplicity of the system permits its efficient operation by any of the employes. Accumulation of litter in all of the above-mentioned places is now prevented and places from which it was physically impossible to remove the material before are now readily kept clean. The apparatus is kept in continuous operation so that it is ready for use at any minute of the working day and from 8 to 10 bbls. of material are removed daily.

The installation of an adequate dust removal system not only betters the working conditions, but almost without exception, in plants where spontaneous combustion flashes or explosions were of frequent occurrence, these dangers have been entirely eliminated and the fire hazards greatly reduced.

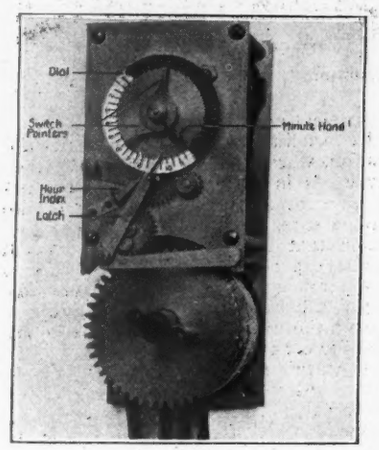
The accompanying illustration shows a Sturtevant vacuum cleaning system, with a small amount of material in the bag after the tank has been emptied. For purposes of taking the photograph from which the engraving was made, the cleaning tool was operated for about 15 min., as the tank had just been emptied when the photographer arrived. In other words, this shows the material picked up in about 15 min. of cleaning, and is about one-fifth of the material which is ordinarily removed from the tank at one emptying of same.

Automatic Switch Designed to Operate Twice Daily.

The small self-starting synchronous motor has recently been put to a new use in operating an automatic time switch recently developed by the General Electric Co. The switch is designed for use in automatically turning on and off the lights which are used to illuminate advertising boards, signs, show windows, or for any of the numerous applications of an automatic time switch. It is intended primarily for use on a-c. circuits, the frequency of which is maintained at a constant average value by means of a Warren master clock.

The switch is designed to operate twice daily, that is off and on every 24 hrs., each operation consisting of two parts or steps, i. e., of snapping the switch, and of preparing it for the next operation. The time switch as a whole consists of the synchronous motor, a dial by which the time setting is obtained, a gear train, and a double pole, 20-ampere, 250-volt, G-E snap switch.

The clock, or time recording parts of the switch, consists of a revolving dial, a minute hand, both driven by the synchronous motor. The dial is divided into 24 main divisions representing the hours of the day, and is half black to distinguish between the hours a. m. and p. m. The actual hour of the day is read by means of a stationary index finger below and slightly to the left of the center of the dial. The minutes are indicated by a minute hand which makes one revolution every hour like the minute hand on a clock. To read the time the hour is determined by the figure nearest the pointer, and the minutes by the position of the minute hand.



T-7 Automatic Time Switch.

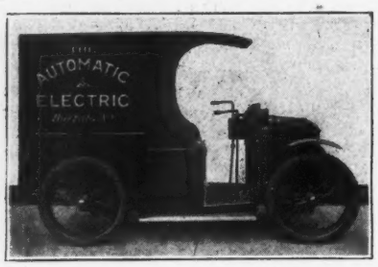
In the illustration, the clock indicates 8:25 a. m.

On the dial are two arms which may be set to indicate any two hours for the two operations of the switch. The motor revolves the dial until one of the arms comes in contact with the point of the latch *I*, forcing it back until the pin of the idler *F* is released and the idler drops into mesh with the gear *G*. The gear *G* drives the switch gear *N* through a pinion, turning the handle of the switch until it snaps. As *G* revolves it carries the roller *H* around counter-clock-wise until it depresses the end of the lever *K* against a spring. The lever *K* draws the latch *I* down and under the pin of the idler *F* and out of engagement with the pointer on the dial. When the roller *H* passes the end of the lever *K*, the latter is drawn up by a spring, causing the latch *I* to push the idler *F* out of engagement with *G*. During the second portion of the operation the switch gear *N* is being driven forward so that when the idler *F* is pushed out of mesh, the snap switch has turned through a portion of the next cycle. It is held in this position under tension by the roller *H* coming back under the elbow of the lever *K*.

The switch is very easy to install, it only being necessary to see that it is in an upright position, hanging to a screw at the top and fastened at the bottom by the lugs on the case. The connections are simple, four wires being brought out through the bottom of the case. The two nearest the front are connected to the line, and the other two to the load. The motor is directly connected to the line terminals inside the case, hence it runs all the time, starting as soon as the line terminals are connected.

Electric Car for Industrial and Commercial Purposes.

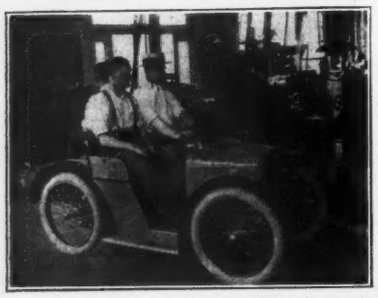
In these times of economy and retrenchment the question has often been asked by the prudent business man—"Why should I go about in a big, high-powered car, which necessitates a large



"Automatic Electric" as Delivery Car.

investment and calls for a very substantial expenditure for maintenance and operation, when a smaller car would serve my needs in every way? Would it not be prudent and economical for me to have a sure, efficient means of transportation that I may acquire for a small initial expenditure, may operate for a few cents a day, and at the same time enjoy all the luxury and convenience within the radius of my ordinary activities for each day?"

With this thought in mind, the "Automatic Electric" has been developed. This car, which may be parked in a space 4 by 8 ft., fully meets the demand of the times. It is efficient, economical, and at the same time will do everything that a larger car will accomplish within a radius of 50 to 60 mi., at a speed of 15 to 18 mi. per hr.—and it will do all these things at a minimum initial investment, and at a maintenance cost that is almost negligible. Aside from its economy of operation, the "Automatic Electric" has many distinct advantages. Because of its size it can be advantageously used in congested traffic. Scarcity or inconvenience of parking space presents no difficulties. It is comfortably upholstered in leather, having a deep, soft seat and back rest. The placement of the steering and control levers is such that the driver may enjoy restful support at all times. It is distinctive in appearance, noiseless, clean, ever-ready, and offers quick, convenient transportation in taking the business man to his office; for a run over the country-side; to the golf links or suburban home; for the social engagements of the day or evening. It is just



Industrial Shop Car Model of "Automatic Electric."

the vehicle for taking the children to school and for the social needs of the lady of the house.

The "Automatic Electric" is also manufactured in commercial and industrial shop car models, all having the same general chassis and mechanical features. The commercial model is unique and suited for the high-class merchant and retailer. It possesses distinct advertising value, because of its size and impressive appearance. It not only meets his haulage requirements but insures clean, reliable deliveries at a small operating and maintenance cost. This car has a cruising radius of 50 mi. on one charge of electricity at a speed of 15 mi. per hr. and a load capacity of 500 lbs. There is but one easy step from the seat to the curb, and young women may act as chauffeurs as the car is very easy to drive.

The shop car model is a car which fills a long felt want in industrial plants, and it is therefore of special interest to factory managers, executives, plant owners. It provides quick, convenient, intershop transportation and saves the time of the busy executive in making inspections and keeping in touch with the various departments, just as the industrial truck or tractor saves manpower in material handling. It also has many other uses in plants, such as carrying men and materials, distributing mail, assisting paymasters, timekeepers, watchmen and others in the performance of their duties. The size and flexibility of this car allows the driver to go anywhere about the plant. For with its narrow tread of 35 ins. and its short wheel base of 65 ins., the average factory aisles and doorways offer no barrier to its progress.

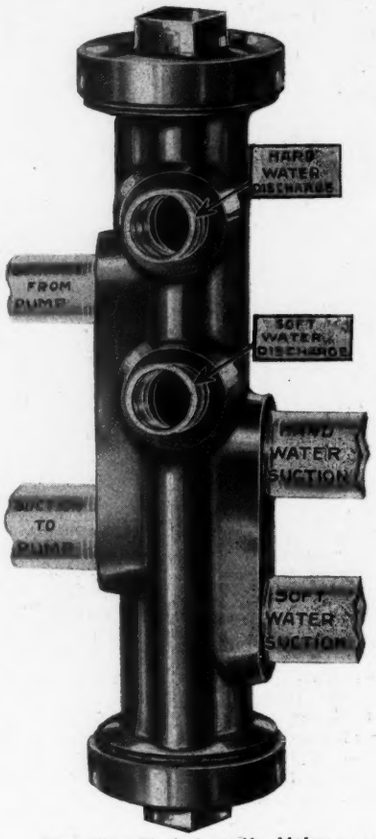
The economy of the "Automatic Electric" is obvious. Practically the entire expense is the cost of recharging the batteries which is but a few cents per day. A complete charging apparatus is furnished with each car without extra cost. The amount of care and attention it requires is almost negligible. The "Automatic Electric" is built by the Automatic Transportation Co., 2933 Main street, Buffalo, N. Y.

Automatic Valve Applicable to "Twin" Pumping Duty.

The "Dual" automatic valve, manufactured by the Dual Automatic Valve Co., Best building, Rock Island, Ill., while designed primarily to solve the problem of providing automatic hard and soft water supply service in connection with electric house pumps, is applicable to any "twin" pumping duty. The main features of the "Dual" automatic valve, which is shown in the accompanying illustration, are thus enumerated by the manufacturer:

Principle of Operation—The "Dual" has six openings. Two are connected to the inlet and outlet openings of the pump; two are for the suction lines to well and cistern, and two are for discharge into tanks or to faucets. Now, three pistons traveling in a cylinder are so spaced that when the soft water suction port or opening is closed the hard water suction port will be open and the two corresponding discharge ports will be closed and opened. (The ports connected to pump suction and discharge are always open.) The pistons which slide up and down, opening and closing the ports, are actuated by pressure. Drawing off water at any soft water faucet causes the pressure on the soft water line to reduce. Then the greater pressure on the hard water line, exerted against the pistons, moves them into position to close the hard water openings. And vice versa, opening a hard water faucet results in a greater pressure on the soft water line, which exerted on the pistons, moves them oppositely to close the soft water openings.

Simplicity—While automatically accomplishing the many things mentioned,



The "Dual" Automatic Valve.

the "Dual" automatic valve is simplicity itself—is entirely free from any complicated working parts which can cause trouble. It has no springs, valves or valve seats, leathers or any other part or mechanism which, through wear, weakness or corrosion, would ever interfere with its positive performance. It is built on the balanced valve principle. Nothing moves except the pistons, which automatically open and close the proper water ports. These pistons are made in one unit and constitute the only moving part. They slide back and forth freely, are easily moved one way or the other, according to which direction the greater pressure is exerted.

Material—All parts of the complete "Dual" automatic valve are made of high-grade cast bronze. With ample clearance around the pistons and with internal water lubrication, there is no wear. The solid bronze construction is insurance against rust and corrosion.

Economy—It costs nothing to operate the "Dual" automatic valve. More pressure on one discharge line than on the other moves the piston. No water is wasted and no power except pressure is required. On the other hand, the installation of the "Dual" insures an automatic hard and soft water service, using but one pump; therefore, it saves the cost of a pump, and the saving of time, as well as saving the inconvenience of operating hand valves, must be obvious.

Types of "Dual" Installations—In a word, the purpose of the "Dual" is to make it possible to use one pump to deliver two kinds of liquid, independently and automatically. So think of the "Dual" only in connection with single pump installations. For complete automatic service, electric motor-driven pumps are required in any event. However, the "Dual" valve can be used with a pump operated by hand, gas engine or other power. When so used it takes the place of the hand valves; and the pump does not have to be stopped when changing from one kind of water to the other.

New Electric Self-Loading Truck of Improved Design.

The Cowan Truck Co., Holyoke, Mass., has recently put on the market a new electric lift truck of improved design. This truck, which is shown in the accompanying illustration, while retaining the constructional advantages of the former design, incorporates many improvements, including a number of features such as the "anti-kick" device and vertical lift mechanism, which are stated to be new applications to electric lift truck construction. Some of the important features of the Cowan electric self-loading truck are described in bulletin No. 5, issued by the Cowan Truck Co., from which the following data is extracted:

Unusual flexibility in operation is secured by the availability of three speeds forward and three reverse; 4-wheel steer about a common center, giving a turning radius from extreme outside point of 7 ft. 5.5 ins.; vertical lift of load platform, and an overall length of but 102 ins. This truck will operate in intersecting aisles 57 ins. wide. The lifting mechanism is claimed to be 4 to 5 sec. faster than that of any similar truck on the market. The platform may be stopped and direction reversed at any point going up or down. The controller, steering lever, foot pedal and lifting mechanism switch are all at the drive end of truck, operator may face either way.

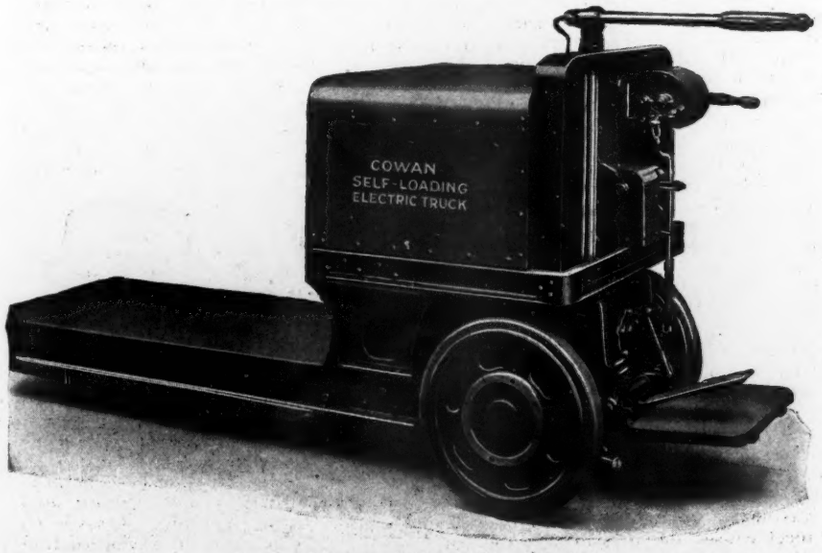
This truck is proof against hard usage, inexperienced operators and meddlers. In order to operate the foot pedal must first be depressed, closing circuit and releasing brakes. The circuit-breaker will close only when the controller is in neutral position. This requires the operator always to start in first speed, moving up to the speed desired. Upon release of pressure from foot pedal the circuit is broken and the brakes applied, stopping the truck instantly. The controller handle is removable to prevent meddling. An "anti-kick" device takes all the jar off the steering handle. Springs under the batteries prevent injury to the cells from vibration and shock.

The necessary parts are reduced to a minimum, making for simplicity in operation. All parts are interchangeable, being manufactured in quantity and accurately machined. The battery, controller, lifting mechanism, motors and all parts are readily accessible for inspection or oiling. The capacity of the truck is guaranteed up to 5000 lbs. The truck may also be used as a light-duty tractor, the frame being made with coupling for draw-bar attachment.

The frame is of strong steel channel construction and heavy castings, hot riveted, built to carry 5000 lbs. under all conditions of load. The draw-bar attachment to couple the truck as a light-duty tractor, with trailers, is located at the rear end of the truck, the pull being exerted through the frame and not through the lifting platform. A heavy bumper casting at the rear end of the truck takes accidental shocks and protects the rear end of the loading platform. At the drive end foot pedal and steering lever may be folded out of the way vertically, shortening the overall length to 91.5 ins. to allow the truck to stand on elevators or in small spaces.

The wheels are of heavy steel castings with standard, pressed-on, solid rubber tires. The brake is of the automatic, external-contracting type, with extra large braking surface around heavy steel drum, 8 ins. diam. by 2.5-in. face, mounted on end of worm shaft. Non-burning brake lining is furnished. The motor is General Electric heavy-duty series wound, low-heating, "railway" type, mounted horizontally, with single reduction worm drive. "S.K.F." ball bearings are used throughout the power unit. The controller is of the heavy-duty drum type, metal, with built-in circuit-breaker. The battery supplied with the Cowan truck is the "Exide-Ironclad," 12 cells of 238-ampere-hr. capacity. The "Edison" 21-cell, A-6 battery or other types may also be used.

The lifting mechanism for raising or lowering the load platform is of the heavy bell crank type. It is actuated by an independent General Electric series wound motor, with worm gear reduction. The platform elevates vertically, with a maximum rise of 4.5 ins. in 5 sec., carrying 5000-lb. load; full lowering time is 3 sec. The platform may be stopped at any point going up or down and the direction reversed. A brake on the motor shaft prevents "coasting" or accidental dropping of the load. An automatic trip stops the load platform when fully elevated or lowered. The operation of the lifting mechanism is controlled by an electric switch at the drive end of the truck.



Cowan Electric Self-Loading Truck.

Keeping Posted on Window Display Ideas.

No attempt has been made to cover the window display efforts of thousands of progressive stores on an intensive scale. The field is far too vast for any one trade paper to adequately handle it. Yet there must be hundreds of unusual window displays that are lost to the outside world every year for this good reason. The average merchant or display manager has no time to travel around looking over the window displays in various cities. It is a job that would require scores of field workers were this country to be properly covered from coast to coast.

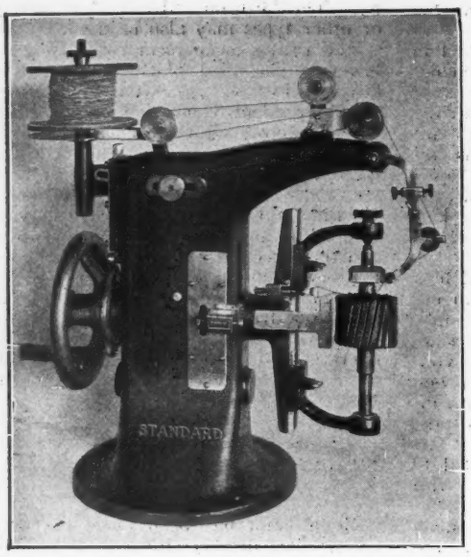
To bring the latest and unusual ideas in window trimming to merchants and display managers is the object of the *Window Display Reporter*, published by Ernest A. Dench, of Sheepshead Bay, N. Y. Mr. Dench receives hundreds of window display reports from his corps of correspondents each month, and out of this number about 50 of the choicest examples find their way into each issue of the *Window Display Reporter*. The first issue will be out early in January, 1922.

Armature Winding Machine With Few Moving Parts.

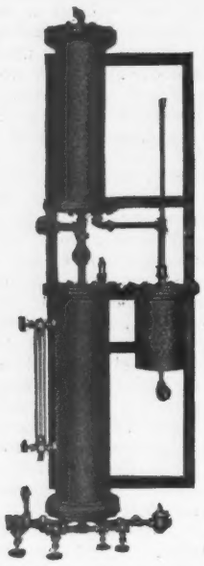
To replace the tedious and expensive processes of winding by hand new armatures in factories and rewinding in repair shops, the Community Machine & Tool Works, Inc., 122 Centre street, New York City, has recently placed on the market its standard armature winder.

The machine is sturdily built, with few moving parts and wearing surfaces, simple in design and easy to understand and operate. It is constructed especially with a view to low cost of upkeep and repair and is mechanically precise in its operation and accurate in results. The apparatus consists primarily of a stout base carrying a reciprocating wire support actuated by a cam carried on the power shaft which also mounts a flywheel. Above the flywheel is a spindle carrying the wire reel. The wire is threaded through a series of tension pulleys, resembling in appearance the rotary bobbins of a sewing machine. This tension system maintains a uniform tension on the wire irrespective of the size of the armature to be wound or of the size of the wire, by a simple spring adjustment on the back of the machine.

This machine winds rapidly all sizes and types of armatures up to 1 hp. with



Standard Armature Winding Machine.



Improved Evaporator Wall Set.

any kind of wire and without removing the commutator. It counts the turns, forms the leads and does not require any skill to operate. Since it occupies a small space and weighs only 65 lbs. it is readily moved. It is claimed that this machine will wind any standard form of armature with a saving of 75% in time over hand winding, in addition to maintaining a uniform tension on the wires and therefore is a particularly economical installation in the shops of makers of small motors, generators, fans, etc.

New Oil-Pressure System for Electric Hoists.

The weighted accumulator for oil-pressure systems for many years has been a standard installation. The idea was one borrowed from the hydraulic pressure-pump system which has, from the early use of hydraulic presses, been in service for the equalization of water pressure delivered by the pumps. It was well adapted for the purpose intended, but with apparatus in which the demands were more exacting, such as the operation of brake and clutch engines, for hoisting apparatus, some improved design for accomplishing this purpose was much to be desired.

The Allis-Chalmers Mfg. Co., of Milwaukee, one of the largest manufacturers of hoists for all purposes, particularly heavy-duty machines for mine service, long recognized the shortcomings of the weighted accumulator. Through a very careful study of the problem, with many experiments calculated to rectify the undesirable features of this antiquated system, particularly for the service demanded in connection with heavy electric hoists, Allis-Chalmers engineers developed an entirely new means for maintaining the oil pressure for operating brake and clutch engines.

The new system is a radical departure and embraces many very desirable features. Among these are compactness of design; self contained; it has no stuffing boxes, suction or discharge valves; the pump requires no attention nor upkeep; and is more cleanly as the leakage of oil and the presence of drip pans in the old system were always much in evidence.

Exhaustive tests in service have demonstrated its great capacity and reliability. In one test, with one pump running, the brake was applied and released 18 times in 1 min., during which time the oil pressure remained constant. The pump was then stopped and released 15 times before the system became inoperative.

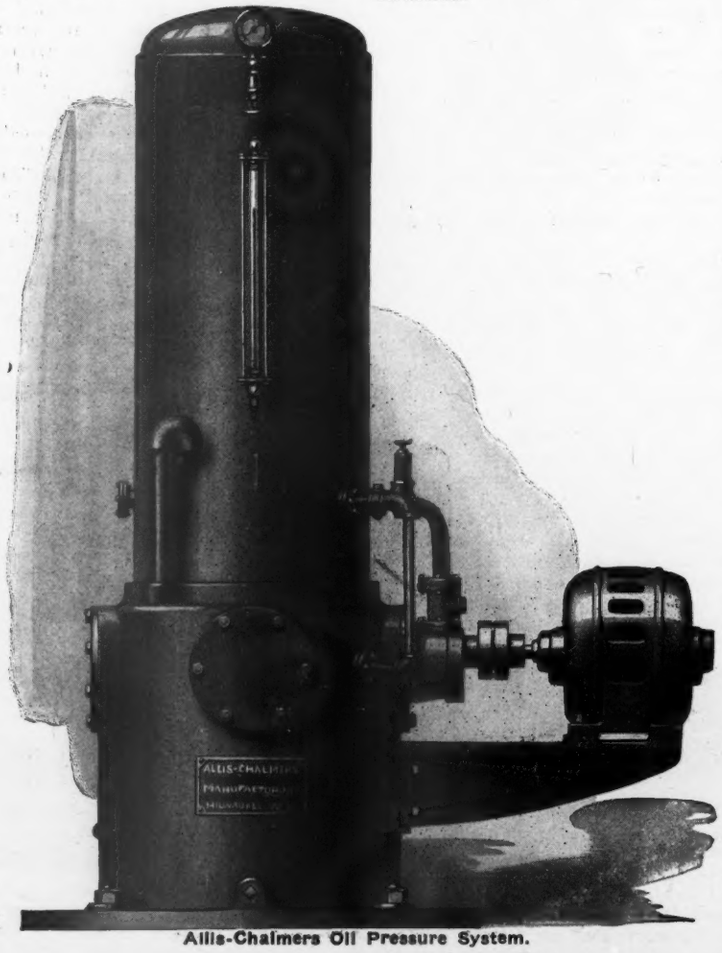
A test made on a weighted accumulator, of equal size, showed that with one pump running, the brake could be operated only eight times, and with the pump stopped the system became inoperative after the brake had been operated but four times.

These tests proved that the new system, shown in the illustration, was more than twice as effective with one pump in operation, and, with the pump stopped, nearly four times as serviceable.

Unique Evaporator Set to Supply Distilled Water.

The accompanying illustration shows a complete evaporator set for providing small quantities of distilled water. The set consists of an evaporator containing coils of brass tubing and to which steam is supplied. The vapor from this evaporator passes to a distiller and is condensed in the coils of this unit by circulating water which flows through the shell. If the distilled water is to be used as drinking water it then passes through an aerating filter, but if it is to be used in a laboratory or in a manufacturing process the filter is omitted.

The set is very compact and is mounted complete on an angle iron frame with the piping as shown and ready for the steam and water connections to be made to it, and the dimensions of the complete set are only 7 ft. high by 2 ft. 4 ins. wide. It has a capacity of from 15 to 30 gals. of distilled water per hour, depending upon the steam pressure available, and is manufactured by the Griscom-Russell Co., 90 West street, New York City. The evaporator and distiller units are of the Reilly coil construction.



Allis-Chalmers Oil Pressure System.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Lewistown Electric Co., Lewistown, Ill., has installed a new lightning arrester of the Westinghouse make at its plant.

Auto Electric Devices Corp., New York City, has filed notice of increase in its capital stock from $5000 to $25,000.

Louisville Electric & Manufacturing Co., Louisville, Ky., has filed notice of increase in its capital stock from $75,000 to $115,000, for general expansion.

Western Union Telegraph Co., Harrisburg, Pa., will install an underground conduit system to replace its overhead lines on Third and Walnut streets.

Golden Electric Manufacturing Co. is the new name adopted by the Brixius Electric Co., 148 Reed street, Milwaukee, manufacturer and repairer of motors, dynamos, etc.

O. & R. Electrical Supply Co., Inc., Monroe, N. Y., was recently organized to take over the electrical wiring and supply business of the Orange & Rockland Electric Co. of Monroe.

Bigelow Electric Manufacturing Co., an Illinois corporation, has filed notice of organization to operate in New York. H. D. Roseth, 110 Mercer street, is representative.

Westinghouse Storage Battery Co., 308 North Elm street, Greensboro, N. C., is planning the erection of a local plant for the manufacture of wireless equipment. R. O. Holland is manager.

Standard Underground Cable Co., Westinghouse building, Pittsburgh, has filed plans for the erection of an addition to its plant at Pike and 17th streets, estimated to cost $200,000.

New York Steam Corp., 280 Madison avenue, New York City, has filed plans for extensions and improvements in its plant at 507-19 East 59th street, including the installation of new equipment, estimated to cost $300.000.

Save Electric Co., 254 36th street, Brooklyn, N. Y., has awarded a contract to Z. J. Bergeron, 1940 Lawrence street, Toledo, O., for the erection of its proposed 2-story plant for the manufacture of electric lamps, 75 by 330 ft., estimated to cost $250,000.

Robert Forsyth, sales manager, Majestic building, Milwaukee, has organized his business under a corporate charter, taking the name of Robert Forsyth, Inc. The capital stock is $5000. Mr. Forsyth will continue to specialize in power equipment and machinery.

Rubber Insulated Metal Corp., 91 William street, New York City, manufacturer of "Rimco" insulation, industrial truck tires, "Rimco" insulated pliers and screw drivers, insulated flexible couplings, rubber faced pulleys and rubber covered rolls, under the "Elchemco" process of bonding rubber to metal, has announced that the original management with C. P. L. Huston, president, and William F. Hart, sales manager, has again assumed control for the purpose of exclusively manufacturing mechanical rubber goods. Executive and sales offices will be maintained at the above address.

Westinghouse Electric & Manufacturing Co., Pittsburgh, has arranged for the erection of a 3-story plant building at Ninth avenue and Second street, Huntington, W. Va., for a branch establishment, to handle business in West Virginia, Ohio, Kentucky and Tennessee.

Lionel Corp., 48-52 East 21st street, New York City, is now issuing to the trade an attractive two-color folder featuring the new Lionel twin-motor locomotive. Views of its interior construction and an actual photograph of its unusual strong pulling power are shown.

New York Telephone Co., 15 Dey street, New York City, has filed application with the Public Service Commission for permission to issue bonds for $50,000,000, the proceeds to be used solely for the purchase of property and for extensions and improvements in its plants and system.

Standard Thermometer Corp., Cleveland, N. Y., recently organized to conduct the business operated by Eugene Morenus under the name of E. Morenus & Co., will continue to manufacture temperature instruments in the plant already equipped by Mr. Morenus, adding thereto such improved devices as will be necessary to manufacture a guaranteed product.

Ideal Electric & Manufacturing Co., Mansfield, O., which has recently developed a new high-speed synchronous motor, has engaged the services of E. R. Johnson of Minneapolis to take entire charge of all synchronous motor sales. Mr. Johnson's intimate association and many years of comprehensive study in this field have well fitted him for this work.

Radio Corporation of America, 233 Broadway, New York City, is planning for the early operation of its new local radio plant at Port Jefferson, L. I., to be one of the largest stations of its kind in the world. It will have a capacity of transmitting and receiving 500 words a minute, and with power to reach all parts of the world.

Standard Electric Stove Co., Toledo, O., has just issued a leaflet descriptive of the new circulation type "Standard" electric water heater which "manages" the heat, according to the manufacturer, so that it is utilized with the utmost efficiency. The leaflet describes five models of the new heater, ranging in demand from 660 to 3960 watts. They are built upon the unit principle. The interchangeable heating coils may be removed and replaced without shutting off the water and it is claimed that they cannot be overheated, thereby minimizing the danger of burnouts. Multiple control permits various degrees of heat to be maintained in the boiler according to individual requirements.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., manufacturer of electric controlling devices, has issued bulletin No. 9604 entitled "Starters for Small A-C. Motors," which describes and illustrates the a-c. automatic starters with mercury type overload relays made by the company. The theory of the new mercury interlock is given and curve included to show how tripping depends upon the time and the percentage of overloading.

Belden Manufacturing Co., 23d street and Western avenue, Chicago, has announced the appointment of C. P. Cushway as manager of the cable and specialties department. Mr. Cushway will have supervision over that part of the business pertaining to telephone, automobile and appliance cord assemblies, cordage, flexible cable and insulating materials, and to this work brings several years' experience in the engineering department of the company.

Powdered Coal Engineering & Equipment Co. moved its offices and manufacturing plant from Chicago to Buffalo, N. Y., Nov. 1. The personnel of the organization has been somewhat changed and H. B. Pruden has been elected chairman of the board, and J. W. Lansing, of Buffalo, has been elected president. The new board of directors of the company is as follows: J. W. Lansing, Fenton M. Parke, J. E. Finley, Harry R. Wait, J. C. Trefts, H. B. Pruden, B. W. Wistar, W. M. Faber and Stephen T. Lockwood.

Morse Chain Co., Ithaca, N. Y., manufacturer of power transmission appliances exhibited at the International Textile Exposition in Boston, Oct. 31-Nov. 5, a full line of chain samples. The company also had on display as the main part of its exhibit a spinning frame end with motor and chain drive in place, mounted on an improved type of bracket designed particularly for application of individual motors and chain drives to old spinning frames such as are now running in many textile mills throughout the country and which have proved successful in service. This exhibit was particularly interesting to cotton mill engineers, as it illustrated a practical method of equipping old spinning frames and twisters with individual motors and chain drives, which, it is stated, results in increasing the production from these frames to the maximum that can be obtained for any given count of yarn from the latest type of new motor driven frames as supplied by the manufacturer.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

A. W. HONYWILL, chairman of the Hartford (Conn.) section of the American Society of Mechanical Engineers, has been elected chairman of the Connecticut state executive committee of the Society.

WILLIAM M. SWEET, vice-president and a director of the Klaxon Co., 194 Wright street, Newark, N. J., has relinquished his duties with the General Motors Corp. to devote his entire time to the Klaxon interests.

R. I. BAIRD, who was formerly connected with the sales department of the Electric Storage Battery Co., Philadelphia, has been placed in charge of western sales for railway car lighting, industrial trucks, etc., with headquarters in the Marquette building, Chicago.

H. B. BAKER, who was recently appointed stores manager of the supply distributing house of the Western Electric Co. at Dallas, Tex., has been with the Dallas house for 10 yrs. He started in the warehouse there and has been in turn stockkeeper and a stores manager.

SIDNEY G. DOWN, for 10 yrs. Pacific district manager of the Westinghouse Air Brake Co., and president of the Westinghouse Pacific Coast Brake Co., with headquarters in San Francisco, has been appointed general sales manager of the company, with offices in Wilmerding, Pa.

WILLIAM K. BIXBY has resigned from the board of directors of the Wagner Electric Manufacturing Co., St. Louis, and has been succeeded by James M. Buick, vice-president and general manager of the American Car & Foundry Co. Mr. Bixby plans to spend the winter in India and South America.

TYLER G. PRICE, of the engineering department, Commonwealth Edison Co., Chicago, who won the Doherty medal for his paper, "The Friendship of Our Customers," was awarded this prize at the Edison Club's 1921 Commencement Party. This is the first time the Doherty medal—given annually by Henry L. Doherty of New York City for the best paper read before a section meeting of the National Electric Light Association—has ever been won by a Commonwealth Edison employe.

H. H. JONES, general manager of the San Diego (Cal.) Consolidated Gas & Electric Co., has been appointed one of the five trustees of the San Diego Chamber of Commerce, which is charged with making a drive for the purchase of 1000 acres of industrial lands located adjoining the harbor. A sum of $75,000 is to be raised by popular subscription to purchase this large industrial site and secure profitable industries.

J. T. TYKOCINER, assistant research professor of electrical engineering at the University of Illinois, Urbana, Ill., delivered an address recently to electrical engineering students on "European High Power Electric Stations" in a joint meeting of the Electrical Engineering Society and the Urbana section of the American Institute of Electrical Engineers. Slides and moving pictures were used to illustrate the lecture. Prof. Tykociner came to the University of Illinois from the research department of the Westinghouse Electric & Manufacturing Co.

C. H. MACKELFRESH has been placed in charge of a new district office which has been opened at 6 Greenwood building, Cincinnati, by the Rail-

C. H. Mackelfresh.

way & Industrial Engineering Co. of Greensburg, Pa. He is a graduate of the University of Cincinnati, class of 1909, and for several years past he has been connected with the supply department of the Westinghouse Electric & Manufacturing Co., having been previously engaged in central station and general engineering work.

SPENCER A. COVELL, engineer for the Public Service Commission, Maryland, has returned from England, after several months' absence for investigation work.

CHARLES D. OLENDORF, New York City, has been retained as special adviser for the City Transit Commission, for work in connection with property valuations.

EDWARD KELLEHER, Camden, N. J., has been appointed assistant secretary of the state Board of Public Utility Commissioners. He will maintain an office at Newark, N. J.

CHARLES SCHNEIDER, formerly superintendent in charge of electrical construction of the Robbins & Myers Co., Springfield, O., manufacturer of electric motors, generators and fans, has been appointed general factory superintendent of the company. He joined the Robbins & Myers Co. in 1898 and wound and assembled with his own hands that year the first power motor ever built by the company. Previous to his employment by the Robbins & Myers Co., Mr. Schneider had several years' experience in central station work.

MARSHALL J. MAXFIELD, formerly instructor in electrical engineering at the Pennsylvania State College, has accepted the position of director of laboratory instruction, department of industrial engineering, Pratt Institute, Brooklyn, N. Y.

WALTER J. BERRY has resigned as operating engineer of the steam and electric power plant of the Hotel Bossert, Brooklyn, N. Y., to accept a position as a salesman with the Superheater & Engineering Co., 1816 Woolworth building, New York City.

BURT K. SPENCER, formerly electrical engineer with A. C. Wood of Philadelphia, is now directing the underwriting of a new line of insurance, covering indemnity against burnout or breakdown of electrical apparatus for the Travelers Indemnity Co., Hartford, Conn.

CHARLES M. SULLIVAN, formerly Pittsburgh district manager of sales for the Milwaukee Electric Crane & Manufacturing Co., Milwaukee, has become connected with Manning, Maxwell & Moore, Inc., of New York City, as salesman in its Pittsburgh office on cranes produced by the Shaw Crane Works, Muskegon, Mich.

PAUL D. BIRDSALL, purchasing agent of the Merchants Heat & Light Co. and allied corporations, Indianapolis, has been elected president of the Purchasing Agents Association of Indiana. Mr. Birdsall succeeds Dwight S. Ritter, city purchasing agent, who was president for 3 yrs.

OBITUARY.

J. P. DUGGER, of Homewood, Ill., secretary for 28 yrs. of the Kewanee Boiler Co., died Oct. 29 at Indianapolis after a long illness. He is survived by his wife. Mr. Dugger was a member of the Calumet Country Club and the Masonic Order.

FREDERIC NICHOLLS, chairman of the board of directors, Canadian General Electric Co., died Oct. 25 in Toronto, Ont., at the age of 65 yrs. He was born in England, educated in Stuttgart, Germany, and settled in Canada in 1874. Mr. Nicholls was the means of organizing the first incandescent lighting system in Canada, and was keenly interested in the promotion of the first street railway system in the Dominion. He was chiefly responsible for what is said to be one of the finest hydroelectric development systems in the world—the Electric Development Co.'s plant at Niagara Falls and its subsidiary 85-mi. transmission line to Toronto. Mr. Nicholls was president of the National Electric Light Association 1896-1897.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Concord, N. H.—Boston & Maine Railroad Co., North Station, Boston, Mass., will build a coaling plant, with elevating and conveying machinery, at its new round house, sand house and other works buildings now in course of erection at Concord. Bids will soon be asked. The work is estimated to cost about $200,000.

Foxboro, Mass.—Considerable electrical equipment will be installed in the 2-story and basement hospital here to be erected by the State Department of Hospitals, Boston. It will cost about $113,000. H. F. Harris, North Attleboro, Mass., has the erection contract.

Malden, Mass.—Electric motors and other industrial electrical equipment will be installed in the 2-story mill to be erected by the Revere Knitting Mills at Eastern avenue and Ferry street. Estimated to cost $40,000. Ground has been broken.

Worcester, Mass.—M. J. Whittall Associates have construction under way on a power house, to be used in connection with a weave shed at their carpet mills on Southbridge street, now building. The entire project will cost in excess of $100,000.

Middleton, Conn. — Portland Silk Co. has awarded a contract to the H. Wales Lines Co., Meriden, Conn., for the erection of a 1-story power house.

Pawtucket, R. I.—Electric motors and other industrial electrical equipment will be installed in the manual training school to be erected by the Board of Education on Fountain street, with cost estimated at $1,000,000, including machinery.

Brooklyn, N. Y.—Brooklyn Edison Co., 360 Pearl street, has made application to the Public Service Commission for permission to issue bonds for $1,000,000, forming the remainder of a total issue of $10,000,000. A large part of the proceeds will be used for plant extensions and system improvements.

Buffalo, N. Y.—Electric motors and other industrial electrical equipment will be installed at the proposed 3-story plant addition to be constructed by the American Body Co., 1200 Niagara street, manufacturer of automobile bodies.

New York, N. Y.—New York Edison Co., Irving place and 15th street, has taken a contract for light and power service for the new 14-story apartment house at Park avenue and 38th street, with installation to comprise about 3500 lamps and 100 hp. in motors.

New York, N. Y.—New York Edison Co., Irving place and 15th street, is arranging for an early public offering of its proposed $30,000,000 bond issue, the proceeds to be used for general operations, plant extensions and improvements, etc.

Olean, N. Y.—Olean, Bradford & Salamanca Railway Co. has been formed with a capital of $3,808,000, by a consolidation of the Bradford Electric Railway Co. and the Olean, Bradford & Salamanca Railway Co. System and plant extensions and improvements are planned. The incorporators are J. B. Mayer, C. N. Mason and F. L. Bartlett. The company is represented by J. P. Quigley, Olean.

Ossining, N. Y.—The Superintendent of State Prisons, C. F. Rattigan, is perfecting plans for the installation of a new underground electrical feeder system, pumping plant and auxiliary equipment at Sing Sing Prison.

Phillipstown, N. Y. — Phillipstown Electric Corp. has been incorporated with a capital of $50,000, to operate a local electric light and power system. The incorporators are H. C. Deraham, W. M. Benjamin and W. C. Osborn. The company is represented by Osborn, Fleming & Whittlesey, 170 Broadway, New York City.

Princeton, N. Y.—Adirondack Power & Light Co., Amsterdam, N. Y., has received approval of a franchise for furnishing light and power service at Princeton by the Public Service Commission, and will soon commence extensions to its system in this district.

Thiells, N. Y.—The Board of Managers of Letchworth Village, M. B. Patterson, president, 7 Wall street, New York City, will install new power equipment, coal-handling machinery and other kindred apparatus at the local institution. L. F. Pilcher, Capitol building, is state architect.

Asbury Park, N. J.—A power plant for general factory operation will be erected by the Richelieu Motor Corp., 649 Mattison avenue, in connection with its proposed new 1- and 2-story automobile manufacturing plant on Asbury avenue, estimated to cost $200,000. Electric motors and other industrial electrical equipment will be installed. Samuel A. Reeves is president.

Dover, N. J.—Following the acquisition of the Newton Electric & Gas Co., the Lambertville Public Service Co. and the Flemington Electric Light, Heat & Power Co., the New Jersey Power & Light Co., is arranging for the construction of a transmission line from White House Station to Flemington, about 8 mi., for connection with the new municipalities to be served and existing systems. The company will also extend its service to New Hope, Pa., opposite Lambertville on the Delaware river, and has acquired the capital stock of the New Hope Electric Co. General expansion for commercial and industrial service throughout the territory is planned.

Newark, N. J.—The Board of County Freeholders will arrange plans for improvements in the lighting system at the Court House. Investigation of present installation will be made and specifications prepared for a standardized plan of electric illumination in the structure. The Building Committee of the Board is in charge.

Orange, N. J.—Considerable electrical equipment, including motors, mechanical draft apparatus, etc., will be installed in the addition now in course of erection at the public school, Park and Ashland avenues, estimated to cost $137,000.

Paterson, N. J.—Considerable electrical equipment, including motors, fans, etc., will be installed in the proposed Public School No. 8, to be erected by the Board of Education at South Paterson, estimated to cost close to $500,000. William T. Fanning, Colt building, is architect.

Trenton, N. J.—The City Commission has concluded an agreement with the Trenton & Mercer County Traction Co. for the installation of an underground conduit system for its lines on Lincoln avenue, replacing the present overhead feeder system on this thoroughfare. The installation is estimated to cost $25,000, and in accordance with agreement is to be completed by July of the coming year.

Ventnor City, N. J.—The City Council has entered into a new contract with the Atlantic City Electric Co., Atlantic City, N. J., for the installation and operation of an improved street-lighting system. A former agreement has been cancelled owing to the unsatisfactory character of the operation.

Wilmington, Del.—The Board of Harbor Commissioners will have plans and specifications prepared at an early date for the installation of conveying, hoisting and kindred machinery, electrically operated, at the marine terminal, now in course of construction. The equipment will include traveling cranes, tractors, trailers, coaling apparatus, etc. The installation of electric lines at the property will be commenced at an early date.

Allentown, Pa.—Considerable electrical and mechanical equipment will be installed in the ice cream manufacturing plant to be erected by the M. & G. Co., estimated to cost $300,000.

Allentown, Pa.—Electric power and other equipment and considerable mechanical apparatus will be installed in the proposed hotel to be constructed at Seventh and Walnut streets, at an estimated cost of $1,000,000. A local company is being organized to carry out the project. City Engineer Harry F. Bascom is interested in the enterprise.

Bentleyville, Pa. — The Borough Council has approved a contract with the West Penn Power Co., Pittsburgh, for the installation and operation of a new street-lighting system for a period of 5 yrs.

Brockwayville, Pa.—Snyder Township Light, Heat & Power Co. has been incorporated with a nominal capital of $5000, to operate a local light and power system. M. E. Keys, Brockwayville, is treasurer.

Easton, Pa.—The Pennsylvania Edison Co. is completing the installation of new equipment at its power plant on Dock street, to provide for increased capacity.

Easton, Pa.—Considerable electrical and power equipment will be installed in the proposed local plant to be erected by the Forbes Aluminum Co., Steele Building, in the Southside district, estimated to cost $150,000. The company was recently incorporated with a capital of $4,500,000 under Delaware laws. Ewing M. Forbes is president.

Fayetteville, Pa.—Following a hearing before the Public Service Commission, the Fayetteville Electric Co. and the Greene Township Electric Co. have arranged a territorial agreement. The companies are planning to extend their lines to neighboring sections.

Foxburg, Pa.—Clarion River Power Co. has preliminary plans under way for the construction of a hydroelectric generating plant on the Clarion river, estimated to cost $3.000,000. The project is headed by H. D. Walbridge & Co., 14 Wall street, New York City.

Harrisburg, Pa.—The City Council is drafting an ordinance to provide for the installation of a new lighting system on North Second street, from Walnut to State street.

Harrisburg, Pa.—United Ice & Coal Co., Forster street, has plans under way for the construction of an addition to its ice-manufacturing plant, with capacity of about 100 tons per day. It is estimated to cost $200,000, with electrical and other operating machinery.

Lancaster, Pa.—Pequea Electric Co. has been incorporated under state law with a capital of $10,000, to operate a light and power system in this vicinity. Elam H. Myers, Willow street, is treasurer.

McKeesport, Pa.—The Duquesne Light Co. will proceed at once with the construction work for the extension of the cluster light system as ratified by the city council recently. Address Councilman Stratton.

New Castle, Pa.—New Castle Electric Co. has taken over the lines of the Pennsylvania-Ohio Power & Light Co., Youngstown, O., a subsidiary of the Republic Railway & Light Co., in all Pennsylvania territory, and in the future will operate the system in conjunction with its other lines. The consideration is said to be $500,000. The acquisition includes a 22,000-volt, 3-phase system, with substations and equipment, as well as that portion of the company's power plant over the Pennsylvania line at Lowellville.

Oxford, Pa.—New London Electric Co. and the Penn-Oxford Electric Co. have been organized under state laws, each with a nominal capital of $5,000, to operate electric light and power systems at New London and Oxford, respectively. John H. Ware, Jr., Oxford, is treasurer of both companies.

Philadelphia, Pa. — The Consolidated Ice Co., 2333 North Bodine street, has filed plans for the erection of a power house at its plant.

Philadelphia, Pa.—Cadillac Automobile Co. has taken bids for the construction of a power house at its building at 25th and Spruce streets.

Phoenixville, Pa. — Considerable electrical equipment will be installed in the 3-story mill addition to be erected by the Watco Knitting Co., Bridge and Wheatland streets.

Pittsburgh, Pa.—U. S. Engineers' Office will open bids early in November for new engines and other equipment for use at the Emsworth Dam, Ohio river.

Baltimore, Md.—A power plant will be constructed by the Wizard Check Endorser & Printing Machine Co., Calvert building, at its new plant at Highlandtown, near Baltimore, plans for which have been completed. It is estimated to cost $300,000. F. S. Weise is president; E. A. Fletcher, 407 North Charles street, is architect.

Eckhart, Md.—Hagerstown & Frederick Railways Co. has completed the installation of a distributing system at Eckhart, and plans for immediate operation. The company's line has been extended from Frostburg.

Winchester, Va.—C. L. Robinson has preliminary plans under way for the construction of an ice-manufacturing plant, estimated to cost $70,000. Quigley Hafet, 155 Garfield avenue, Winchester, is architect.

Grafton, W. Va.—The power plant of the Grafton Power & Electric Co. is reported to have been sold to the Kentucky-West Virginia Power Co., a subsidiary of the American Gas & Electric Co., both located at 30 Church street, New York City. The new owner will make a number of extensions and improvements in the plant, and will operate the station in conjunction with its near plant on the Cheat river, near Kingwood, W. Va., ground for which has recently been broken. N. M. Argabrite is vice-president and general manager.

Star City, W. Va.—Electric motors and other industrial electrical equipment will be installed in the local plant to be erected by the Star Glass Co. Ground will be broken for the structure at an early date.

Asheville, N. C.—Asheville Light & Power Co. will make extensions and improvements in its plant. The Common Council is planning for extensions in the street-lighting system.

Charlotte, N. C.—Southern Power Co. has concluded negotiations with the City Council for extensions in the street-lighting system on Fourth street.

Greensboro, N. C.—R. T. Joyce, operating a local power plant, is planning the construction of a transmission line to Westfield, N. C., to furnish light and power at this point.

Greensboro, N. C.—The Common Council is planning the installation of a new street-lighting system.

Leesburg, Ga.—W. G. Martin, Leesburg, and J. R. Herrin, Mt. Airy, Ga., are organizing a company to construct a hydroelectrical plant on the Broad river. Preliminary plans are under way.

Perry, Ga.—The Common Council is planning extensions and improvements in the municipal electric system. Bonds for $15,000 will be voted.

Haines City, Fla.—Peninsular Telephone Co. will expend $10,000 on plant improvements. The plans include underground cables, etc. Address Mr. Watts, manager.

Lakeland, Fla.—Electric lines will be extended by the city to Lakeland Highlands, 8 mi., and to Haskell, 7 mi., for heating and lighting. Address the mayor.

Leesburg, Fla.—Grass Fibre Pulp & Paper Co. has plans under way for the erection of a steam-operated power plant, to be used in connection with its new local pulp and paper mill. E. R. Lacy is vice-president and general manager.

San Antonio, Fla.—An election will be held to vote on the question of issuing $6,000 worth of electric light plant bonds. Address the mayor.

Tallahassee, Fla.—Guy Winthrop, Tallahassee, and associates are planning the construction of a hydroelectric generating plant on the Ocklocknee river, with transmission and distributing system.

Tampa, Fla.—G. O. Warner, Jr., contemplates purchasing a complete radio outfit and establishing a wireless station.

NORTH CENTRAL STATES.

Troy, O.—Bids were received on Oct. 31 by the Miami County Commissioners for enlarging and improving the County Power Plant by the installation of additional machinery, etc., and for the construction of an electric transmission line from Miami County plant to the Knopp Childrens' Home. Address T. B. Radabaugh, County Auditor.

Grosse Pointe Park, Mich.—Bonds amounting to $150,000 have been voted for additional fire alarm boxes, police signals, the improvement of street lighting and other equipment. Address the city clerk.

Mariette, Mich.—R. L. Blackman is planning extensions and improvements in his local power plant.

Bedford, Ind. — Interstate Public Service Co., Indianapolis, is planning the rebuilding of its local power plant, destroyed by fire, Oct. 8, with loss estimated at $75,000.

Indianapolis, Ind.—The Board of County Commissioners has awarded a contract to George A. Weaver & Son, 2223 Brookside Parkway, for extensions and improvements in the power house at the county jail.

Chicago (Hyde Park), Ill. — A "white way" is proposed for 53rd street. At a meeting held at the Sisson hotel, C. H. Shepherd, Monadnock block, electrical engineer, presented plans which contemplate lights

75 ft. apart, of 500 to 600 candle power with suggested concrete lighting posts of a design which will blend with the architecture of buildings on that street.

Herrin, Ill.—Corn Belt Electric Co. will apply to the council for a new franchise. The old franchise has four years to run, but the Missouri Pacific Railroad Co., which operates the interurban line, wishes to know what it can count upon in the next two decades.

Oshkosh, Wis.—The City Council has passed the ordinance providing for the creation, designation, installation, maintenance and lighting of an ornamental district for the City of Oshkosh. Address the mayor.

Sturgeon Bay, Wis.—Ornamental lighting may be installed on Cedar street. Address the city clerk.

Independence, Mo.—An ordinance has been passed by council and an election will be held to vote on the question of granting a franchise to the Jackson County Light, Heat & Power Co. Address the mayor.

Kansas City, Mo.—The City Council is planning improvements and extensions in the street-lighting systems on Walnut, 10th, 24th and 27th streets, and Prospect avenue.

St. Joseph, Mo.—The question of issuing $1,000,000 bonds to build and equip a commercial lighting plant will be voted upon. Address Mayor Elliot Marshall.

St. Louis, Mo.—St. Louis Lead & Oil Works, International Life building, will build a 1-story power plant at its works on Manchester avenue.

Coffeyville, Kans.—Albert Emanuel Co. of New York City is negotiating for the purchase of the local light and power plant, with a view of rebuilding the plant.

Leavenworth, Kans.—The Board of Governors, U. S. Penitentiary, has approved plans for the construction of a power plant at the institution to cost about $125,000. W. B. Biddle is warden.

Carthage, S. D.—The Carthage electric light plant was recently destroyed by fire with a loss of $25,000. Address city clerk.

SOUTH CENTRAL STATES.

Sergent, Ky. — Commercial Coal Mining Co., Connellsville, Pa., is planning the installation of new electrical equipment at its properties at Sergent. The company has recently increased its capital to $500,000 for expansion.

Lambert, Miss.—Electric light and street improvement bonds amounting to $30,000 have been voted. Address the mayor.

Crowley, La.—The Common Council is planning the installation of a new municipal electric power plant. J. O. Herpin is city manager.

Shreveport, La. — United States Sheet & Window Glass Co., Columbus, O., is planning the construction of a power plant for general operating service at its glass manufacturing plant at Jewella, near Shreveport, now in course of erection.

Shreveport, La.—The City Council is planning the installation of a new fire alarm system to cost about $25,000. Bonds will be voted at once.

Chickasha, Okla.—Chickasha Gas & Electric Co. will extend lines. Address Fred W. Insull, president.

Fairfax, Okla.—The Common Council has arranged an appropriation of $80,000 for municipal improvements, including extensions and betterments in the electric lighting system. V. V. Long & Co., Colcord building, Oklahoma City, is the engineer.

Wilson, Okla.—The Common Council is arranging a bond issue of $70,000 for extensions and improvements in the municipal lighting system. Isaac Roberts, mayor, is in charge.

Austin, Tex.—The Common Council has completed plans for extensions to the municipal power plant, to include the installation of new equipment. The work will cost about $35,000.

Cameron, Tex. — The Common Council has arranged a bond issue for municipal improvements, including the construction of an electric light and power plant. A bond issue of $250,000 will be provided. The Engineering Service Co., Sumpter building, Dallas, Tex., is engineer.

Corpus Christi, Tex.—Gulf Coast Power & Light Co., recently incorporated with a capital of $100,000, is planning the construction of a power plant. The company is also arranging extensions and improvements in its present generating station.

Edinburg, Tex. — The Common Council has approved a bond issue of $30,000 for the installation of a new electric system.

WESTERN STATES.

Colorado Springs, Colo.—Work will probably be started within the next two weeks on the installation of ornamental lights on South Tejon street and on East Colorado avenue. Address City Electrician Joseph Caldwell.

Portland, Ore. — Reorganization of Portland's telephone service, involving the changing of 35,000 numbers and an initial expenditure of over $1,975,000, was announced recently by officials of the Pacific Telephone & Telegraph Co.

Roseburg, Ore.—The city voted bonds of $500,000 a year ago to finance the building of a municipal power plant. This plan seems to have been abandoned and it is now proposed to purchase the plant and distribution system of the local company, the Douglas County Light & Power Co.

Oroville, Cal.—Representatives of the Great Western Power Co. are in this city making a preliminary survey for a canal system to extend south and east of the Feather river. Plans include the extension of this system across the Yuba river.

PROPOSALS.

New Philadelphia, O.—Bids will be received Nov. 10 for the construction and installation of electrical water pumping equipment and appliances and pumphouses at the waterworks in this city. Address F. R. Kislig, director.

Woodward, Okla.—Bids will be received Nov. 15 for electric light improvements and the furnishing of one 300 or 350-hp. tube boiler, f. o. b. Woodward. Address J. D. Berry, city clerk.

Washington, D. C.—Sealed proposals will be opened in the office of the Treasury Department, supervising architect's department, Nov. 14, for furnishing and installing lighting fixtures in the U. S. Treasury building, Washington, D. C., in accordance with drawings and specifications, copies of which may be obtained at the office of James A. Wetmore, acting supervising architect.

INCORPORATIONS.

Lawrence, Mass.—Hanley Electrical Co. Capital, $15,000. To manufacture and deal in electrical equipment. Thomas J. Hanley, 58 Camden street, Methuen, Mass., is president and treasurer.

New York, N. Y.—Magic Electric Water Heater Co. Capital, $500,000. To manufacture electrically operated water heaters and kindred equipment. Incorporators: J. Monte, J. Meyers and Marks Wolff, 41 Park Row.

Newark, N. J.—National Light & Electric Co. Capital, $100,000. To manufacture electric fixtures and other electrical equipment. Incorporators: George Ollendorf, Harry Hirsch and Harry A. Friedman, 9 Clinton street.

Sebring, Fla.—Mitchell Telephone Co Iincorporators: L. L. Morgan, president, and Willie B. Mitcheli, secretary.

Vincennes, Ind.—Brewer Auto Electric Co. Capital, $25,000. To deal in electrical equipment. Incorporators: H. L. Brewer, Elijah Brewer, G. W. Purcell and E. R. Purcell.

New York, N. Y.—Beidner Electrical Supply Co. Capital, $10,000. To manufacture and deal in electrical equipment. The incorporators are R. Cymberg, M. and H. Edelman. The company is represented by Reisfeld & Comberg, 99 Nassau street.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electric Lamps (177)—A mercantile firm in Sweden desires to purchase or secure an agency for the sale of X-rays and electric lamps. Quotations should be given c. i. f. Swedish port. Cash to be paid. References.

Refrigerating Machines (199)—An inquiry has been received from Western Australia for quotations on small refrigerating machines for use in connection with a fishing boat cooling chamber, of a capacity of from 3 to 4 tons of fish. Credit to be opened in the United States to cover the cost of the machine.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Public Offering of Philadelphia Co. First Mortgage Bonds.

Lee, Higginson & Co., Ladenburg, Thalmann & Co. and Hayden, Stone & Co. are offering a new issue of $16,000,000 Philadelphia Co. first refunding and collateral trust mortgage 6% bonds, series A, dated Feb. 1, 1919,; due Feb. 1, 1944, at a price of 87 and interest, yielding over 7.15%. The Philadelphia Co., organized in 1884, owns or controls an extensive gas producing, transporting and distributing system in Pennsylvania and West Virginia, furnishing and distributing the greater part of the entire gas supply of the City of Pittsburgh. It also owns stock representing the equity in the electric railway system of Pittsburgh and vicinity. It owns the entire capital stock of the Philadelphia Oil Co., and it controls, through entire common stock ownership, the Dequesne Light Co., which does substantially all the commercial electric light and power business in Pittsburgh and in the greater part of Allegheny and Beaver counties, Pennsylvania.

Maryland Utility Redeems Notes Before Maturity.

The Consolidated Gas, Electric Light & Power Co., Lexington building, Baltimore, has arranged for the immediate payment of a 5% note issue, maturing Dec. 15. The notes will be paid at par with accrued interest. In making the offer the company expresses its desire to give holders an opportunity to reinvest the proceeds to better advantage than would be the case possibly at the time of maturity. The acceptance of the offer is optional with the holders.

Illinois Utilities to Issue Additional Stocks and Bonds.

Seven subsidiary companies of the Illinois Traction System have filed applications with the Illinois Public Utilities Commission for the right to issue additional stock and bonds. The Bloomington & Normal Railway & Light Co. wishes to issue $69,000 first general mortgage bonds; $55,000 bonds secured by notes and $73,000 preferred stock. The Danville Street Railway & Light Co. asks to sell $64,000 refunding gold bonds, and the Urbana and Champaign Railway, Gas & Electric Co. $3,000 consolidated and refunding mortgage bonds. The Madison County Light & Power Co. of Edwardsville wishes to issue $69,000 first mortgage bonds and the Galesburg Railway, Lighting & Power Co. $400,000 consolidated and refunding mortgage bonds and $300,000 bonds secured by gold notes.

Allis-Chalmers Manufacturing Co.

Allis-Chalmers Manufacturing Co., for the 8 mo. ended Aug. 31, 1921, reports net profits available for dividend requirements of $1,729,901. Preferred and common dividends paid during this period amounted to $1,092,820, leaving $637,081 added to surplus.

Columbia Gas & Electric Co.

For the 12 mo. ended Sept. 30, 1921, gross earnings were $14,854,042, an increase of $729,275 over the previous 12 mo. Net after taxes and including miscellaneous income totaled $9,816,197, increase of $226,258, and surplus after fixed charges amounted to $4,505,406, decrease of $43,463.

Southern California Edison Co.

	1921.	1920.
August gross	$1,455,347	$1,401,741
Net after taxes	793,930	759,612
Total income	924,050	885,979
Surplus after charges	574,325	607,576
8 mo. gross	9,784,406	8,158,931
Net after taxes	5,582,474	4,296,901
Total income	6,569,553	5,285,537
Surplus after interest charges	4,125,625	3,220,053

Vermont Hydro-Electric Corp.

Earnings Statement.

	August, 1921.	August, 1920.
Operating revenue	$ 38,474.61	$ 53,348.59
Operating expenses, maintenance, taxes and rentals	26,902.91	25,627.86
Operating income	11,571.70	27,720.73

Statement of balance of net income for the 12 mo. ended Aug. 31, 1921 and 1920:

	1921.	1920.
Operating revenue	$ 524,690.69	$ 550,179.44
Operating expenses and taxes	276,409.61	287,862.58
Maintenance	50,869.42	35,877.74
Rentals	18,980.00	20,029.94
Total operating expenses, maintenance, taxes and rentals	346,259.03	343,770.26
Operating income.	178,431.66	206,409.18
Other income	11,263.61	14,661.82
Total income	189,695.27	221,071.00
Deductions from income:		
Interest on funded debt	104,464.33	81,232.64
Other deductions from income	20,874.60	7,860.62
Total deductions from income	125,338.93	89,093.26
Net income	64,356.34	131,977.74
Provision for dividend on preferred stock	45,499.98	38,783.34
Balance of net income	18,856.36	93,194.40

NOTE—Earnings for 12 mo. ended Aug. 31, 1920, include operations of component companies adjusted to present operating conditions for the period prior to Nov. 1, 1919.

Portland Railway, Light & Power Co.

	1921.	1920.
August gross	$ 781,547	$ 807,751
Net after taxes	213,462	236,018
Surplus after charges	26,990	48,510
12 mo. gross	10,064,468	9,042,269
Net after taxes	3,227,148	2,801,251
Surplus after charges	989,710	543,453

New Jersey Power & Light Co.

Earnings Statement.

	August, 1921.	August, 1920.
Operating revenue	$ 37,139.12	$ 41,105.24
Operating expenses, maintenance, depreciation, taxes and rentals	25,238.41	28,088.11
Operating income	11,900.71	13,017.13

Statement of balance of net income for the 12 mo. ended Aug. 31, 1921 and 1920:

	1921.	1920.
Operating revenue	$ 472,551.06	$ 413,052.36
Operating expenses and taxes	257,700.29	225,652.02
Maintenance and depreciation	66,658.57	48,346.93
Rentals	6,255.78	9,279.47
Total operating expenses, maintenance, depreciation, taxes and rentals	330,614.64	283,278.42
Operating income.	141,936.42	129,773.94
Other income	11,992.04	6,983.44
Total income	153,928.46	136,757.38
Deductions from income:		
Interest on funded debt	50,450.00	49,991.39
Other deductions from income	24,310.89	18,818.35
Total deductions from income	74,760.89	68,809.74
Net income	79,167.57	67,947.64

Dividends.

	Term.	Rate.	Payable.
Brooklyn Edison	Q	$2	Dec. 1
Elec. Bond & Share, com.	Q	2%	Oct. 20
Elec. Bond & Share, pfd.	Q	1.5%	Nov. 1
Houghton Co. El. Lt., pfd.	Q	$0.75	Nov. 1
Pacific G. & El., 1st pfd.	Q	$1.50	Nov. 15
Pacific G. & El., org. pfd.	Q	$1.50	Nov. 15
Public Service Inv., pfd.	Q	$1.50	Nov. 1
Sierra Pacific El., pfd.	Q	$1.50	Nov. 1
Sou. Cal. Edison, com.	Q	2%	Nov. 15
J. G. White, Inc., pfd.	Q	1.5%	Dec. 1

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 24.	Bid Oct. 31.
Adirondack Electric Power of Glenns Falls, common	6	12	12
Adirondack Electric Power of Glenns Falls, preferred	6	80	80
American Gas & Electric of New York, common	..	103	115
American Gas & Electric of New York, preferred	6	41	42
American Light & Traction of New York, common	..	95	96
American Light & Traction of New York, preferred	6	80	80
American Power & Light of New York, common	4	63	64
American Power & Light of New York, preferred	6	73	74
American Public Utilities of Grand Rapids, common	..	9	7
American Public Utilities of Grand Rapids, preferred	..	16	15
American Telephone & Telegraph of New York	9	108	109
American Water Works & Elec. of New York, common	..	5	6
American Water Works & Elec. of New York, particip	7	15	15
American Water Works & Elec. of New York, 1st preferred	..	60	60
Appalachian Power, common	..	5	5
Appalachian Power, preferred	7	49	50
Cities Service of New York, common	+extra	180	181
Cities Service of New York, preferred	6	55	55½
Commonwealth Edison of Chicago	8	110½	111
Comm. Power, Railway & Light of Jackson, common	..	8	8
Comm. Power, Railway & Light of Jackson, preferred	6	25	24½
Federal Light & Traction of New York, common	..	8	8
Federal Light & Traction of New York, preferred	..	59	60
Northern States Power of Chicago, common	..	47	48
Northern States Power of Chicago, preferred	ex.div.7	80	79½
Pacific Gas & Electric of San Francisco, common	..	..	62
Public Service of Northern Illinois, Chicago, common	7	81	81
Public Service of Northern Illinois, Chicago, preferred	6	81	82
Standard Gas & Electric of Chicago, common	..	8	8
Standard Gas & Electric of Chicago, preferred	8	33	33½
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	5
Western Power of San Francisco, common	..	29	29
Western Union Telegraph of New York	..	82	83
Industrials—			
General Electric of Schenectady	8	128½	128
Westinghouse Electric & Mfg. of Pittsburgh, common	7	44	44½